4848—15/7/12--19,000.

THE

AGRICULTURAL JOURNAL

OF THE

UNION OF SOUTH AFRICA.

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The Agricultural Journal

OF THE UNION OF SOUTH AFRICA.

Vol. III. JANUARY, 1912. No. 1.

Issued MONTHLY in English and Dutch by the Department of Agriculture.
Communications to be addressed to the Editor, Department of Agriculture, Box 434, Pretoria.
Subscriptions should be posted to the Government Printer, Box 373, Pretoria.
Advertising inquiries should be addressed to the Metropolitan Advertising Co., Box 962, Capetown.

Gall-Sickness of Imported Cattle, and the Protective Inoculation Against this Disease.

By Dr. A. THEILER, C.M.G., Acting Director of Veterinary Research.

IN a previous article * I have shown that the so-called gall-sickness of imported cattle is caused through the presence of an organism, formerly described under the name of "Marginal Points": this organism consisted in the main of a nucleus and being devoid of protoplasma I called it an "Anaplasm".

For the last six years I have shown that cattle born and bred in certain parts of South Africa, which I had used for my experiments, contained these parasites in their blood in a latent form; although they were not visible in the blood, they were transmitted by the injection of such blood into susceptible imported animals or calves born in a stable and kept free from ticks. In nearly all these cases, however, *P. bigeminum*, the redwater parasite, appeared as a result of such injections, and accordingly from the fact that the redwater parasites (with a shorter incubation time) appeared first and were followed by the appearance of the gall-sickness parasites, it is evident that such a regular succession of the two naturally led to the supposition that they were somehow connected, the latter being considered to belong to the life cycle of the former.

It was due to a lucky coincidence that I was enabled to demonstrate the dual nature of these organisms. Cattle which had been inoculated in England with our South African redwater contracted a grave disease when injected in Pretoria with blood taken from Transvaal animals: this disease presented many differences to redwater, chiefly by reason of its long incubation time, its prolonged duration, and the appearance of the characteristic marginal points on the edge of the blood corpuscles, now called anaplasms. It had thereby been proved that the two diseases could be separated; that the cattle which had been inoculated in England with redwater and became "salted" did not possess any immunity against gall-sickness.

In one of my former experiments I was able to obtain a pure infection of anaplasmosis (gall-sickness) and I considered it advisable to repeat these experiments on a larger scale in order to obtain a pure infection with the gall-sickness parasites, and to prove that such animals are still susceptible to redwater; if this was correct it would complete the evidence of the dual nature of the two infections in the reverse order.

* *Transvaal Agricultural Journal*, April, 1910, p. 423, "A Contribution to Our Knowledge of Gall-Sickness".

My previous experiments had shown that when cattle obtained from the Karroo were injected with redwater they usually contracted this disease, and in all my previous experiments I used such heifers known to be susceptible to redwater. Accordingly, if blood of such animals was injected into freshly imported English cattle, it could reasonably be expected that redwater would not be produced, and it remained to be seen whether such injections would give rise to the appearance of gall-sickness. Should this deduction prove to be correct, then the proof would have been given that gall-sickness is not of necessity and under all circumstances associated with redwater.

PART I.

THE SEPARATION OF GALL-SICKNESS FROM REDWATER.

EXPERIMENT No. 1.—*To note whether the blood of a heifer obtained from the Karroo would produce a pure infection of gall-sickness when injected into a susceptible calf.*

(a) *Blood of Heifer (Karroo)* 906.

Origin of the Blood.—Heifer 906, about eighteen months old, arrived in Pretoria on the 28th October, 1909, and was immediately placed in a clean stable and kept free from ticks. The temperature was taken twice daily and a detailed record kept; no deviations from normal were observed.

On the 7th December, 1909—thirty-eight days after arrival—she was tapped and 20 c.c. defibrinated blood were injected into calf 881.

(*A*) *Calf* 881.—Born on the 20th August, 1909, in a stable at the Laboratory and kept tick-free.

Treatment.—Injected as above at a time when it was just over three and a half months old.

Remarks.—The temperature of this calf at the time of injection and twenty-four hours previously was 103·2° F. On the morning of the 3rd day there was a remission to 101·2°, with a rise to 103° F. the same evening, rising 0·4° F. the following evening and reaching 103·8° F. on the morning of the 5th day.

The temperature now descended and remained at about 100·2° F. until the 14th day; some evening exacerbations to 103° F. were noticed during the next few days.

On the 21st day a reaction commenced, in which the temperature averaged between 101°–102° F. in the morning and reaching 103·8° F. and 104° F. on two occasions in the evening.

The blood was examined daily from the day previous to inoculation until the 45th day, excepting the 28th and 35th days; from the 46th day the blood examination was made every third day.

Gall-sickness parasites in rare numbers were noticed for the first time on the 22nd day, remaining in about the same number for the next few days, and were noted rather more frequently from the 30th day, but at no time were they ever registered as numerous. Blood changes were hardly noticeable.

Test for Immunity against Redwater.—Calf 881 was again injected on the 30th March, 1910, 112 days after the first injection, with 20 c.c. blood of heifer 926. This is a heifer which was inoculated in England with the South African strain of redwater and developed a pure infection of redwater.

Remarks.—A slight reaction followed from the 5th–10th days, with both morning and evening maxima of 103° F. on the 5th days.

The redwater parasites were seen on the 6th day, increasing in numbers during the succeeding twenty-four hours, and reaching their maximum frequency

on the 8th and 9th days; the parasites then disappeared for a few days, reappearing on the 13th and 14th days.

Redwater Immunity Test of Heifer 906.—In order to prove that heifer 906, from which the gall-sickness infection was obtained, represented a pure infection of this disease, it was decided to show its susceptibility to a redwater infection by the following injection :—

(b) *Injection of Blood of English Heifer* 926.

NOTE.—Heifer 926 (redwater infection) was an English beast, which had been injected with South African redwater in London and arrived in Pretoria on the 13th December, 1909.

(*B*) *Heifer* 906.—(See previous animal.)

Treatment.—On the 27th April, 1910—six months after arrival and four and a half months after it had been tapped for the first time—it was injected with 10 c.c. blood of heifer 926.

Remarks.—On the 6th day a slight rise of temperature occurred, reaching 104 ·8° F. the following evening and developing into a definite curve, lasting from the 7th to 14th days, with a maximum evening temperature of 103° F.

For the three days previous and six days subsequent to the injection of blood all microscopical examination proved negative; the redwater parasites were found daily from the 6th to 20th days; the maximum frequency was noted on the 11th day.

Results.—The fact that heifer 906 could be successfully inoculated with blood of English heifer 926 (a pure strain of South African redwater) and developed a typical reaction lasting for some days, with the presence of redwater parasites and the typical characteristics of anaemia, supports the conclusion that heifer 906 was susceptible to a redwater infection, and accordingly the conclusion is warranted that on the date of tapping (7th December, 1909) she was not infected with redwater.

EXPERIMENT NO. 2.—*To note whether the blood of heifer* 906 *and succeeding generations would produce a pure infection of gall-sickness when injected into freshly imported English heifers.*

FIRST GENERATION.

(a) *Blood of Heifer* 906.

(*A*) *Sussex Heifer* 928.—Imported from England and arrived at the Laboratory on the 13th December, 1909. Her temperature was taken twice daily from the date of arrival; the highest record given was 102 ·4° F., which was reached on one occasion only.

Treatment.—On the 20th January, 1910, heifer 928 was injected subcutaneously with 1 c.c. defibrinated blood of heifer 906 (gall-sickness).

Remarks.—For the next forty days the temperature averaged about 101° F. in the morning and between 101°–102° F. in the evening; the only abnormal records were 102 ·2° F. and 102 ·4° F. in the evening of the 12th and 30th days respectively.

From the 40th day onward the curve became somewhat irregular, with an evening exacerbation on the 50th day to 103 ·2° F. From the 55th to 60th days nothing above 102° F. was noted. Taken as a whole the reaction can be said to indicate a slight fever only.

The blood examinations were made daily during the first six days, twice daily during the next four days, and after that at intervals of two days until the 42nd day. On the 42nd day gall-sickness parasites appeared.

On the 45th day two gall-sickness parasites were frequently found in one corpuscle.

Redwater Immunity Test of Heifer 928.—On the 27th April, 1910—ninety-six days after the first injection—heifer 928 was injected with 10 c.c. blood of heifer 926 (an English heifer immunized against redwater in England).

Remarks.—On the 8th day there was a sharp rise to 104° F. in the evening. On the 9th day the morning temperature was 103° F. and twelve hours later it had reached 106·6° F. On account of this high fever she was injected with a 1 per cent. solution of trypan blue on this date. A remission had occurred by the next morning to 102·4° F.

The blood was examined previous to the injection of redwater blood and found normal; the redwater parasites made their appearance on the 7th day after injection; the following day the parasites had increased in numbers and were still noted on the 10th day; they disappeared after the animal was treated with trypan blue.

Results.—Heifer 928 developed a pure attack of gall-sickness, from which she recovered. Although the attack was a slight one, all the typical lesions were present in the blood. When tested with blood of an animal immune to South African redwater she promptly contracted this disease and developed a severe attack, but recovered as the result of the treatment with trypan blue.

(*B*) *Sussex Heifer* 940.—An English heifer, arrived in Pretoria on the 13th December, 1909; she was kept in a tick-free stable; the temperature was taken twice daily, and periodical rises to about 103° F. were noted weekly during the first month, but which could not be accounted for, otherwise the temperature remained normal.

Treatment.—On the 28th February, 1910, heifer 940 was injected subcutaneously with 20 c.c. fresh blood of heifer 906 (gall-sickness infection) as above.

Remarks.—For the next twenty-four days the temperature remained normal and did not deviate in any way from a healthy record; on the following day a slight fever reaction commenced, reaching 103·2° F. in the evening; the morning records for the next fortnight averaged 101° F., and were one degree higher in the evenings.

Microscopical examination of the blood was commenced on the 3rd day, and excepting on the 12th and 13th days, was continued until the 32nd day. On the 20th day the gall-sickness parasites were first noted to be present, but in rare numbers. They were traced in every subsequent examination, but were never found to be very frequent.

Test for Immunity to Redwater.—On the 2nd September, 1910, heifer 940 was infested with blue larval ticks collected from heifers 922 and 925. Both heifers had shown redwater and gall-sickness parasites in their blood.

Remarks.—There was a slight reaction between the 7th and 11th days, and from the next day a second reaction began, reaching the maximum temperature of 106° F. on the 19th day.

A remission due to the injection of trypan blue followed, and the temperature continued somewhat irregularly for the next fourteen days.

Examination of the blood at intervals up to the 17th day gave negative results. On the 18th day the redwater parasites were found in rare numbers; the following day the parasites were more frequent, and as this was the day of the highest fever and the symptoms rather alarming, the animal was treated with trypan blue, resulting in a decrease of parasites and a remission of the temperature. Redwater parasites were noted for the last time two days after injection of trypan blue.

Results.—The inoculation of 10 c.c. fresh blood of heifer 906 (gall-sickness infection) into heifer 940 caused the appearance of a slight fever reaction during which the gall-sickness parasites were found regularly, but in rare numbers. The infestation of infected larval ticks caused the appearance of redwater in the time typical for a tick infestation, and which would probably have been responsible for the death of the animal had the trypan blue not been injected.

Accordingly, in this instance it must be concluded that the preceding gall-sickness reaction did not in any way give immunity to the subsequent infection of redwater.

SECOND GENERATION.

(b) *Blood of English Heifer* 928 (*Gall-sickness Infection*).

NOTE.—Heifer 928, an English heifer, showed a pure infection of gall-sickness as the result of injection of blood of heifer 906.

(*C*) *Sussex Heifer* 933.—An imported English heifer, which arrived in Pretoria on the 13th December, 1909, was immediately placed in a tick-free stable and temperatured twice daily; its temperature remained perfectly normal during the observation period.

Treatment.—On the 5th February, 1910—fifty-four days after arrival—heifer 933 was injected subcutaneously with 50 c.c. fresh blood of heifer 928.

Remarks.—A slight curve ensued from the 13th to the 27th day, characterized by slightly elevated morning temperatures and slight evening rises to 102° or 103° F.; on one occasion 104° F. was registered.

With the exception of the 6th day, the blood was examined daily up to the 27th day, but with negative results for the first ten days. On the 11th day rare gall-sickness parasites appeared.

These parasites were now noticed daily, increasing slightly, but were never present in great numbers; forms undergoing division were occasionally seen.

Test for Immunity to Redwater.—On the 27th May, 1910, heifer 933 was infested with blue larval ticks collected off heifer 871, an animal which was immune to redwater and gall-sickness.

Remarks.—On the 6th and 19th days, evening rises to above 103° F. were recorded, and a reaction commenced on the 21st day, lasting for ten days, of a well-pronounced but not severe character, with the reappearance of gall-sickness parasites on the 29th, 30th, and 31st days. The redwater parasites appeared on the 29th, 30th, and 32nd days.

The animal eventually recovered without any treatment.

Result.—The injection of 50 c.c. fresh blood of heifer 928 (gall-sickness) only produced a slight attack of gall-sickness in heifer 933. It is true that the incubation time was a short one (even shorter than in any other animal we have noticed so far), and is probably due to the fact that a large quantity of blood—and with it a larger number of dormant parasites—was injected.

Heifer 933 was then infested with infected blue larval ticks and a typical attack of redwater followed, from which the animal recovered, indicating again that recovery from an attack of gall-sickness does not give immunity against redwater transmitted in a natural way by means of ticks.

(c) *Blood of English Heifer* 940.

NOTE.—Heifer 940, imported from England, contracted gall-sickness from the injection of heifer 906.

(*D*) *Sussex Heifer* 938.—Imported from England and arrived at the Laboratory on the 13th December, 1909; she was immediately placed in a

tick-free stable and temperatured twice daily. No abnormal records were noted before injection.

Treatment.—Injected subcutaneously on the 9th April, 1910 (eighty-six days after arrival), with 10 c.c. fresh blood of heifer 940 (gall-sickness infection).

Remarks.—The temperature remained normal until the 25th day, when a distinct reaction set in, lasting for ten days, with morning temperatures averaging 102° F. and evening rises to above 103° F.; on one occasion 104·6° F. was registered.

Gall-sickness parasites were noted in but rare numbers during this reaction.

Test for Immunity against Redwater.—On the 10th November, 1910, heifer 938 was infested with blue larval ticks collected from redwater-immune cattle on the station. A sharp reaction followed on the 17th, 18th, and 19th days, reaching 105° F. A slight fever reaction continued up to the 30th day.

Redwater parasites were present on the 27th, 28th, and 29th days, being especially frequent on the 28th day, but disappearing somewhat during the next twenty-four hours.

The animal eventually recovered without treatment. This observation further demonstrates the susceptibility of gall-sickness immune cattle to redwater.

(*E*) *Sussex Heifer* 932.—Imported from England and arrived at the Laboratory on the 13th December, 1909; she was immediately placed in a tick-free stable and temperatured twice daily. No abnormal records were noted.

Treatment.—On the 27th May, 1910—165 days after arrival—this animal was injected subcutaneously with 10 c.c. fresh blood of heifer 940 (gall-sickness infection).

Remarks.—Nothing unusual occurred during the following four weeks, but from the 29th to 50th days an irregular curve was noted, with evening records of over 103° F. between the 40th and 50th days.

Generally speaking, the reaction was a slight one.

Gall-sickness parasites were noted for the first time on the 31st day, increasing in numbers in the course of the following days, but never being found in excessive numbers; divisional forms were noted.

Tests for Immunity to Redwater.—On the 24th May, 1911, heifer 932 was tested by the subcutaneous injection of 5 c.c. blood of heifer 1216 (an English heifer which arrived at the Laboratory in January, 1911, and was injected on the 23rd January, 1911, with 5 c.c. blood of heifer 926, redwater infection), and developed a pure attack of redwater.

Remarks.—A slight temperature reaction began on the 6th day, with a sharp rise to 105·4° F. two days later, on which date the animal was injected with trypan blue; the temperature regained normal within forty-eight hours.

Redwater parasites were noted on the 7th day, increasing considerably in numbers the following day; only one redwater parasite was recorded, the day subsequent to the injection of trypan blue. Here also the fact is demonstrated that an animal which passed through an attack of gall-sickness remained susceptible to redwater.

THIRD GENERATION.

(d) *Blood of Heifer* 933.

NOTE.—English heifer 933 contracted a pure infection of gall-sickness from the injection of blood of heifer 928.

(*F*) *Sussex Heifer* 935.—Imported from England and arrived at the Laboratory on the 13th December, 1909; she was immediately placed in a tick-free stable and temperatured twice daily. Occasional exacerbations were noted during the first four weeks, but no cause could be assigned. At the date of injection the temperature was normal.

Treatment.—Injected subcutaneously on the 30th March, 1910, with 50 c.c. fresh blood of heifer 933 (gall-sickness infection).

Remarks.—The temperature remained normal until the 18th day, when a slight curve started, with evening rises and morning remissions, reaching 104° F. on the evening of the 27th day, thence descending to normal.

Considered as a whole the reaction was of a slight character.

The examination of the blood was undertaken daily from the 5th to the 30th day; no changes were noted during the first sixteen days. On the following days gall-sickness parasites appeared.

(*G*) *Sussex Heifer* 924.—This animal had been immunized in England against South African redwater.

She arrived at the Laboratory on the 13th December, 1909, was immediately placed in a tick-free stable and temperatured twice daily. A slight irregular record was noticed during the first week, but from then no unusual temperatures were registered during the observation period.

Treatment.—On the 30th March, 1910—107 days after arrival—heifer 924 was injected subcutaneously with 10 c.c. blood of heifer 933 (gall-sickness).

Remarks.—The temperature remained normal up to the 35th day, with the exception of one evening record of 103·4° F. on the 29th day. From the 35th day onwards a slight reaction set in, with morning temperatures above normal, but the evening records were chiefly within the usual limits.

Gall-sickness parasites were noted for the first time on the 30th day.

(*H*) *Sussex Heifer* 927.—This animal had been inoculated in England against South African redwater.

She arrived at the Laboratory on the 13th December, 1909, was immediately placed in a tick-free stable and temperatured twice daily; no abnormal records were noted during this time.

Treatment.—The heifer was injected on the 30th March, 1910—107 days after arrival—with 10 c.c. fresh blood of heifer 933 (gall-sickness).

Remarks.—With the exception of a slight rise on the 8th day to 103° F., the temperature remained normal until the 31st day, on which date, however, a decided curve commenced, with a sharp rise to 105° F. on the 42nd, 43rd, and 44th days, and gradually returning to normal.

Gall-sickness parasites were noted to be present in rare numbers on the 34th day.

(e) *Blood of Heifer* 938.

NOTE.—English heifer 938 contracted a pure infection of gall-sickness from the injection of blood of English heifer 940.

(*I*) *Sussex Heifer* 937.—Arrived at the Laboratory on the 13th December, 1909; she was immediately placed in a tick-free stable and temperatured twice daily. In February and April, 1910, this heifer was used in tick experiments with brown adults and nymphae.

Treatment.—On the 27th May, 1910—165 days after arrival—she was injected subcutaneously with 10 c.c. fresh blood of heifer 938. The temperature remained normal until the 27th day, when a slight but distinct curve commenced, reaching its maximum on the 33rd day of 104·6° F. and returning to normal about the 40th day.

Gall-sickness parasites were noticed for the first time on the 20th day, and from this date increased gradually until they became fairly frequent on the

32nd day, remaining present for the next three or four days; at the time the temperature returned to normal they were only present in very rare numbers.

Test for Immunity to Redwater.—Injected on the 28th February, 1911, with 5 c.c. blood of heifer 926 (redwater infection). A doubtful reaction was noticed, but the examination of the blood gave negative results. *Retested* on the 14th June, 1911, with 5 c.c. blood of heifer 1216 (redwater infection). No reaction followed. It is possible that the ticks used in February and April, 1910, transmitted the redwater parasites in such rare numbers that they escaped notice.

(f) *Blood of Heifer* 932.

NOTE.—Heifer 932 contracted a pure attack of gall-sickness from the injection of blood of heifer 940.

(*J*) *Sussex Heifer* 1212.—An imported English heifer, which arrived from England on the 9th January, 1911; she was immediately placed in a tick-free stable and temperatured twice daily; no abnormal records were noted during this observation period.

Treatment.—On the 23rd January, 1911—fourteen days after arrival—heifer 1212 was injected subcutaneously with 100 c.c. fresh blood of heifer 932.

Remarks.—The temperature remained within normal limits until the 21st day, when a slight rise of a definite character was noted, lasting until the 35th day; the morning records averaged 101° F. and 103° F. was the maximum evening limit.

Gall-sickness parasites appeared on the 23rd day, remaining present in rare numbers until 36th day.

Test for Immunity against Redwater.—On the 24th May, 1911, heifer 1212 was tested by the subcutaneous injection of 5 c.c. fresh blood of heifer 1216 (an animal belonging to the same batch as heifer 1212, and which had developed a pure attack of redwater as the result of the injection of blood of heifer 926).

Remarks.—There was a sharp rise of temperature on the 5th day, reaching 105·6° F.; the following day the heifer was noted to be off her feed; a few redwater parasites were noted in the blood. The temperature remained high until the 8th day, when it was considered advisable to inject trypan blue, the parasites having been noted in the blood the previous day in large numbers.

Two days after the injection of trypan blue the temperature regained normal, but redwater parasites remained present until the 10th day.

(*K*) *Sussex Heifer* 1220.—An imported English heifer, which arrived from England on the 9th January, 1911; she was immediately placed in a tick-free stable and temperatured twice daily. No abnormal records were noticed during this observation period.

Treatment.—Injected on the 23rd March, 1911—seventy-three days after arrival—with 10 c.c. fresh blood of heifer 932 (gall-sickness).

Remarks.—Nothing abnormal was noticed until the 27th day, when a temperature reaction commenced of a definite character, lasting until the 45th day, with evening exacerbations on several occasions to 105° F. Gall-sickness parasites were noted on the 26th day, and from this date onwards they rapidly increased in numbers, reaching the maximum on the 38th day.

The animal was not feeding well on the 36th day, but soon rallied and did not lose in condition.

Not yet tested for immunity to redwater.

(*L*) *Sussex Heifer* 1221.—An imported English heifer, which arrived from England on the 9th January, 1911; she was immediately placed in a tick-free stable and temperatured twice daily. No abnormal records were noticed during this observation period.

Treatment.—Inoculated on the 23rd March, 1911—seventy-three days after arrival—subcutaneously with 50 c.c. fresh blood of heifer 932 (gall-sickness infection—see above).

Remarks.—A definite temperature reaction commenced on the 32nd day, lasting for thirteen days. The appearance of the gall-sickness parasites preceded the reaction, and with the onset of fever they increased in numbers. No signs of distress were noticed in the animal.

Not yet tested for immunity to redwater.

FOURTH GENERATION.

(g) *Blood of Heifer* 1212 (*Anaplasmosis Infection*).

NOTE.—Heifer 1212 contracted gall-sickness as the result of the subcutaneous injection of 100 c.c. fresh blood of heifer 932.

(*M*) *Sussex Heifer* 1222.—An imported English heifer, which arrived at the Laboratory on the 9th January, 1911; she was immediately placed in a tick-free stable and temperatured twice daily; no temperature disturbances were noted during this observation period.

Treatment.—Injected on the 23rd March, 1911—seventy-three days after arrival—with 10 c.c. fresh blood of heifer 1212 (gall-sickness infection).

Remarks.—The temperature remained normal until the 28th day, when a definite reaction ensued, lasting until the 50th day, with evening records over 104° and 105° F. on several occasions.

Gall-sickness parasites were noted on the 26th day; they rapidly increased in numbers, and during the first few days of the temperature reaction were present in very large numbers.

The animal presented clinical symptoms of illness on the 35th day: the muzzle was pale, she refused to feed and lost condition.

The heifer remained in somewhat poor condition for some time after recovery.

Not yet tested for immunity to redwater.

(*N*) *Sussex Heifer* 1223.—An imported English heifer, which arrived at the Laboratory on the 9th January, 1911; she was immediately placed in a tick-free stable and temperatured twice daily; no temperature disturbances were noted during this observation period.

Treatment.—Injected on the 23rd March, 1911—seventy-three days after arrival—with 50 c.c. fresh blood of heifer 1212 (gall-sickness infection).

Remarks.—There was an immediate rise of temperature from the 2nd day, developing into a typical curve and returning to normal on the 19th day. From the 3rd day the gall-sickness parasites were noted in great numbers.

From the 20th to the 50th day another reaction ensued, when the gall-sickness parasites were present.

This animal was noted to lose rapidly in condition.

NOTE.—The immediate appearance of the gall-sickness parasites a few days after the injection is an extraordinary occurrence and of a paradoxical nature. Noticing that after the injection of a large quantity of blood in some previous experiments the incubation time was shortened, it is possible that the same explanation holds good in this instance; further, the increased virulency of the parasites after passing through three highly susceptible animals, may have had some influence.

The heifer was not tested for immunity to redwater.

CONCLUSIONS.

The inoculation of the blood of heifer 906 into Africander calf 881, born in the stable and kept tick-free, and subsequently into heifers 928 and 940,

imported from England, was succeeded in all three instances by a pure infection of gall-sickness.

Through a series of four generations the parasites were present as a pure infection, as was proved by the injection of large quantities of blood (50 c.c. to 100 c.c.) of animals which had recovered from gall-sickness and if any other parasites had been present in the blood it could rightly have been expected that out of fourteen imported animals which were all susceptible to redwater and other blood diseases, some at least would have developed one or the other disease. *It has accordingly been proved that a pure strain of gall-sickness can be obtained and can also be continued through a number of animals.*

Special attention must be drawn here to the striking fact that of fourteen English heifers which were susceptible to both redwater and gall-sickness none died, whereas in the experiments enumerated in my first report, out of ten animals, all had severe reactions and five of them died.

The fever reactions in these fourteen new animals were not so severe, and the temperature only occasionally reached a high record. An increase in virulency was noted by passing the infection through subsequent generations and using larger quantities of blood for the injection.

In each of the animals referred to in this report blood lesions were registered. Only in one or two exceptional cases did the changes of the blood indicate a more severe anaemia due to a heavy destruction of corpuscles, as described previously, not sufficient, however, to cause death. Generally, recovery and restitution were observed to occur much quicker than in the experimental animals referred to in previous reports.

I also noticed a difference in the appearance of the gall-sickness parasites both in size and position in the corpuscles. In recording the presence of the parasites in the foregoing experiments, I have purposely omitted to specify *Anaplasma marginale*, the parasite described in previous reports as being a body of the dimensions of a coccus, usually situated *on the border of the red corpuscles*, varying slightly in size.

In all the foregoing experiments the parasites which I noticed were, as a rule, not so regularly and constantly situated on the margin, but were frequently found within the corpuscle somewhat at a distance from the margin.

Although it is difficult to accurately measure the diameters of such small bodies, I am decidedly under the impression that the parasites which I found in heifer 906 were, taken as a whole, somewhat smaller to those described in my previous reports. The remaining characteristics are the same, namely, the parasites easily take the protozoic stain, and divisional forms could be recognized.

In order to distinguish between these two parasites, I propose to designate the one *Anaplasma marginale* (as described previously) and the other, which is more centrally situated in the corpuscle and causes only a slight attack of the disease, *Anaplasma marginale* (variety *centrale*), indicating that, in my opinion, this latter is only a variety of *Anaplasma marginale.*

A further point of importance is clearly brought out by this experiment—and this was the one at issue in the first instance—that recovery from gall-sickness did not prevent a reinfection with redwater. With one exception (an English heifer), the animals promptly reacted to redwater, introduced either by subcutaneous injection of blood or in the natural way by ticks. In some instances the reactions were so severe that if medicinal treatment with trypan blue had not been adopted the animals would probably have died.

The proof is accordingly given in the reverse order that redwater and gall-sickness are two different diseases.

PART II.

THE INOCULATION OF *ANAPLASMA MARGINALE* (VARIETY *CENTRALE*) AS A MEANS OF PROTECTING CATTLE AGAINST GALL-SICKNESS.

Having realized that our strain of *Anaplasma marginale* (variety *centrale*) was less virulent than *Anaplasma marginale* proper, and having noticed that animals injected with variety *centrale* did not suffer at all, or at least not so severely as those injected with *marginale*, it followed, as a matter of course, to make use of the variety *centrale* injection for protective purposes against gall-sickness. As far as South Africa is concerned, however, the problem of protecting imported animals against anaplasmosis alone does not meet all requirements, since all imported animals are also susceptible to South African redwater.

Accordingly, for practical purposes, it is necessary at the same time to inoculate such stock against both diseases. The question to be settled was to find whether it will be advisable (1) to inject gall-sickness first and then redwater, or (2) vice versa, or (3) to inject both simultaneously.

The inoculation against redwater does not offer much difficulty, the subject having received full consideration from various investigators. Trypan blue is a powerful drug for regulating the effect of the inoculation of redwater in the majority of cases, provided the injected animals are under proper observation (see article by Wm. Robertson, M.R.C.V.S., "Immunization of South African-born Cattle against Redwater from a practical standpoint"). It has been the experience that animals treated with trypan blue in the early stages of a redwater infection easily recover, and accordingly trypan blue enables us to check the reaction when it seems likely to develop into a severe attack. Animals treated in this way are undoubtedly immune, and they retain the parasites in their blood just as if they had gone through an attack of redwater without treatment. Attention must be drawn to the fact that care has to be exercised to ensure that the blood used for the transmission of *Piroplasma bigeminum* does not contain other parasites, particularly the virulent strain of gall-sickness (*Anaplasma marginale*).

The following two experiments were made on pure-bred Hereford heifers, all about nine months old, imported into the Transvaal by a private owner for breeding purposes, but before the animals came into the Laboratory stables they had been running in the high veld. They were examined on their arrival, and although the tick infection in the high veld is not a severe one, yet some ticks were found on a few of the animals.

EXPERIMENT No. 3.—*To immunize thoroughbred freshly imported Hereford Heifers against redwater, and as soon as the reaction is finished against gall-sickness.*

Blood of Heifers 926 *and* 932.

NOTE.—Heifer 926 went through an attack of redwater as the result of the injection of blood of heifer 925 on the 20th January, 1910, and heifer 932 went through an attack of anaplasmosis as the result of the injection of blood of heifer 940 on the 29th May, 1911.

(*A*) *Hereford Heifer* 1176.

Treatment.—On the 3rd December, 1910, injected subcutaneously with 5 c.c. fresh blood of heifer 926.

Remarks.—A reaction followed from the 7th to 12th day, with a rise to 104·8 F. in the evening of the 8th day. The redwater parasites were noted in rare numbers during the reaction.

Second Treatment.—Fourteen days after the first injection, i.e. the 17th December, 1910, heifer 1176 was injected subcutaneously with 5 c.c. blood of heifer 932 (gall-sickness).

Remarks.—Some irregular temperatures were noted shortly after, but no high evening records. From the 27th day a slight reaction set in, reaching its maximum between the 52nd and 58th days, with 103° F. as the highest record on the 53rd and 54th days. Gall-sickness parasites appeared on the 27th day for the first time.

(*B*) *Hereford Heifer* 1177.

Treatment.—Injected as above.

Remarks.—A typical redwater reaction followed from the 4th to 11th days, with a temperature of 104° F. in the evening on three occasions. The redwater parasites were found in fair numbers on several days during the reaction.

Second Treatment.—Injected on the 14th day with blood of heifer 932 (see heifer 1176).

Remarks.—Nothing particular happened and there was no indication of any febrile disturbance. The blood was repeatedly examined every second or third day, and anaplasms were found for the first time on the 28th day.

(*C*) *Hereford Heifer* 1178.

Treatment.—Injected as above.

Remarks.—A reaction set in from the 8th day, lasting for five days, with the maximum temperature of 105° F. on the evening of the 11th day. The redwater parasites were noted in rare numbers from the 9th to 12th days and again on the 18th day.

Second Treatment.—With blood of heifer 932 (see heifer 1176) on the 14th day.

Remarks.—Nothing particular happened until the 27th day after this second injection, when a distinct febrile reaction ensued, lasting for about thirty days, but on no occasion did the temperature register over 104° F. in the evening.

The gall-sickness parasites were detected for the first time on the 27th day.

The day of the maximum temperature (39th) corresponded to the time when the parasites were very frequent.

The blood lesions began with anisocytosis, and it was not until the 56th day that some basophile erythrocytes were noticed.

EXPERIMENT NO. 4.—*To immunize freshly imported Hereford Heifers against gall-sickness and as soon as the reaction is finished against redwater.*

(*a*) *Blood of Heifers* 932 *and* 926.

NOTE.—Heifer 932 contracted gall-sickness as a result of the injection of blood of heifer 940, and heifer 926 contracted redwater from heifer 925.

(*A*) *Hereford Heifer* 1182.

Treatment.—Injected on the 3rd December, 1910, with 5 c.c. fresh blood of heifer 932.

Remarks.—With the exception of a sudden rise to 104° F. in the evening of the 16th day, nothing particular was noticed; blood examinations gave negative results until the 23rd day; a reaction commenced on the 28th day; the morning temperatures were above normal and a few exacerbations in the evenings were noted. The gall-sickness parasites appeared on the 31st day.

Second Treatment.—Injected on the 40th day (12th January, 1911) with blood of heifer 926 (redwater infection).

Remarks.—A typical redwater reaction followed from the 9th day, with evening temperatures above 104° F., and reaching 106·4° F. on the 11th day, when the redwater parasites appeared in fair numbers; the animal showed signs of distress and did not feed well. It was accordingly considered advisable to inject it with a 1 per cent. solution of trypan blue. The following day the temperature had dropped to normal, and with the exception of a few irregular records, remained within normal limits.

(*B*) *Hereford Heifer* 1183.—Injected on the 3rd December, 1910, subcutaneously with 5 c.c. fresh blood of heifer 932.

Remarks.—Some irregular reactions were again noted during the incubation time, but microscopical examination of the blood gave negative results.

On the 27th day a reaction started, with evening temperatures of 103° F. on several occasions, and lasting until the 45th day.

The blood examination was recommenced on the 29th day, when the gall-sickness parasites were found.

Second Treatment.—Injected on the 40th day (12th January, 1911) with 5 c.c. fresh blood of heifer 926 (redwater infection).

Remarks.—A slight reaction followed from the 8th to 13th days, with the presence of redwater parasites from the 12th to 16th days.

(*C*) *Hereford Heifer* 1184.

Treatment.—Injected on the 3rd December, 1910, subcutaneously with 5 c.c. fresh blood of heifer 932.

Remarks.—A slight reaction was noted during the incubation time, but the daily examination of blood proved the absence of any parasites or blood lesions.

A temperature reaction followed from the 20th to 44th days, during which time some evening rises were noted to 104° F., with an average record of 102° F. in the morning.

The gall-sickness parasites appeared on the 29th day.

Second Treatment.—On the 40th day (12th January, 1911) this heifer was injected subcutaneously with 5 c.c. fresh blood of heifer 926 (redwater infection).

Remarks.—A slight febrile reaction followed, during which time the redwater parasites were noted on five successive days (12th to 16th).

(*b*) *Blood of Heifers* 937 *and* 926.

NOTE.—Heifer 937 had been injected with blood of heifer 938.
Heifer 926 was immune to redwater.

(*D*) *Hereford Heifer* 1179.

Treatment.—Injected on the 3rd December, 1910, subcutaneously with 5 c.c. blood of heifer 937.

Remarks.—A slight febrile reaction ensued from the 7th to 18th days, during which time the blood was frequently examined, but with negative results.

The gall-sickness reaction commenced about the 28th day and lasted until the 47th day. This reaction was quite distinct, but no high temperatures were noted.

The blood examination was undertaken daily from the 31st day, when the gall-sickness parasites were found to be present.

Second Treatment.—On the 40th day after the first injection (12th January, 1911) heifer 1179 was injected subcutaneously with 5 c.c. fresh blood of heifer 926 (redwater infection).

Remarks.—A definite reaction commenced nine days after this second injection of a fairly severe character, reaching 104° F. in the morning on three occasions and touching 105° F. in the evenings. The redwater parasites appeared eleven days after injection, being fairly frequent in numbers the following day, and still more numerous on the 13th day. The animal showed symptoms of distress and refused to feed; it was therefore thought desirable to inject a 1 per cent. solution of trypan blue; the following day the parasites had disappeared and twenty-four hours later the temperature returned to normal.

(*E*) *Hereford Heifer* 1180.

Treatment.—Injected on the 3rd December, 1910, with 5 c.c. fresh blood of heifer 937.

Remarks.—A reaction set in from the 14th day, the temperature reaching 104° F. in the evening of the 19th and 20th days, and on the 19th, 21st, and 25th days the redwater parasites were noted. This infection must be attributed either to natural infection by ticks or to the blood of heifer 937. As stated before, parasites might have been present in the blood of heifer 937, due to tick infestation, and the parasites escaped notice, but considering that the previous animal, which was injected in the same way and at the same time, did not show any infection, it is more likely that the appearance of the redwater parasites is due to the ticks collected by the animals whilst in the high veld.

No other fever reaction developed as a result of the injection, although there were some indications of a slight curve; the parasites of gall-sickness were detected on the 31st day.

Second Treatment.—On the 40th day (12th January, 1911) heifer 1180 was injected with blood of heifer 926.

Remarks.—With the exception of a slight rise in the evening of the 13th day, nothing unusual was noticed.

The redwater parasites were noted, but in very rare numbers, on the same day.

(*F*) *Hereford Heifer* 1181.

Treatment.—Injected on the 3rd December, 1910, with 5 c.c. fresh blood of heifer 937.

Remarks.—A slight temperature disturbance was also noted in this animal from about the 21st day, when the redwater parasites were noticed in the blood.

The gall-sickness reaction was also of a very mild nature, the temperature rarely exceeding 103° F. The gall-sickness parasites were noticed on the 31st day.

Second Treatment.—Heifer 1181 was injected on the 40th day (12th January, 1911) with 5 c.c. fresh blood of heifer 926.

Remarks.—No febrile reaction followed, but the parasites of redwater were noted on one occasion (24th day).

CONCLUSIONS.

Although these nine animals did not exactly take the course I anticipated, some showing an infection of redwater, which cannot be accounted for with certainty, yet the experiment has demonstrated the fact that imported animals can be successfully inoculated against anaplasmosis with but little risk. It has also been shown that even a severe infection of redwater can be safely controlled with the aid of trypan blue.

These animals were later exposed to natural tick infection in the low veld of the Ermelo District, near the Swaziland border, and at the time of writing (30th November, 1911) have been exposed for nine months without any ill effects.

EXPERIMENT No. 5.—*To note the effect of a simultaneous injection of* (1) *blood of an animal immune against redwater and* (2) *blood of an animal immune against gall-sickness.*

(a) *Blood of Heifers* 926 *and* 932.

NOTE.—Heifer 926 had been injected with blood of heifer 925 on the 20th January, 1910, and developed a pure attack of redwater. Her blood had frequently been used for testing purposes. Heifer 932 contracted gall-sickness as the result of the injection of blood of heifer 940.

(*A*) *Sussex Heifer* 931.—An English heifer, which arrived at the Laboratory on the 13th December, 1909. She was immediately placed in a tick-free stable and temperatured twice daily. No deviations from normal were noted during the observation period (13th December, 1909, to 20th January, 1910).

She was used later on several occasions for experiments with ticks, but without any results.

Treatment.—Injected on the 28th February, 1911, subcutaneously with 50 c.c. defibrinated blood of heifer 932 and simultaneously with 15 c.c. fresh blood of heifer 926.

Remarks.—A reaction followed from the 12th to 18th days, during which the redwater parasites were detected to be very frequent on the 16th day. Another reaction commenced on the 29th day, but of a very mild nature. The parasites of gall-sickness were noted in the blood on several occasions.

(*B*) *Heifer* 939.—An English heifer, which arrived at the Laboratory on the 13th December, 1909. She was immediately placed in a tick-free stable and temperatured twice daily. No abnormal records were noted during the observation period (13th December, 1909, to 7th March, 1910).

NOTE.—This animal had been infested with ticks on various occasions, but without results.

Treatment.—Injected on the 28th February, 1911, subcutaneously with 50 c.c. defibrinated blood of heifer 932 and simultaneously with 15 c.c. fresh blood of heifer 926.

Remarks.—A slight temperature reaction was noticed from the 10th to 15th days; parasites were not detected, but blood lesions appeared on the 18th day, accordingly it must be concluded that the redwater parasites were so rare that they escaped notice.

On the 34th day the gall-sickness parasites were present, and remained during the definite but slight reaction which lasted until the 46th day.

(b) *Blood of Heifers* 1212 *and* 1216.

NOTE.—Heifer 1212 contracted an attack of gall-sickness as a result of the injection of blood of heifer 932.

Heifer 1216 contracted redwater as the result of the injection of blood of heifer 926 on the 23rd January, 1911.

(*C*) *Sussex Heifer* 1211.—An imported English heifer, which arrived at the Laboratory on the 9th January, 1911. She was immediately placed in a tick-free stable and temperatured twice daily. The temperature remained within physiological limits during the observation period (9th January, 1911, to 3rd March, 1911).

Treatment.—Injected subcutaneously on the 24th April, 1911, with 5 c.c. defibrinated blood of heifer 1216 and simultaneously with 5 c.c. fresh blood of heifer 1212.

Remarks.—A sharp rise of temperature was noted on the 7th day, when the parasites of redwater were recorded as being fairly frequent. As the

animal commenced to pass red urine, it was injected with a solution of trypan blue on the 8th day, and by the following morning the temperature had dropped, reaching normal two days later.

From the 30th day a slight reaction ensued for a few days only. The gall-sickness parasites were noticed occasionally from the 50th to 65th days.

(*D*) *Sussex Heifer* 1215.—An imported English heifer, which arrived at the Laboratory on the 9th January, 1911. She was immediately placed in a tick-free stable and temperatured twice daily. No abnormal records were noted during this observation period (9th January, 1911, to 23rd January, 1911).

Treatment.—Injected subcutaneouly on the 24th April, 1911, with 5 c.c. defibrinated blood of heifer 1216 and simultaneously with 5 c.c. fresh blood of heifer 1212.

Remarks.—A reaction set in from the 5th day, with high temperatures, when the redwater parasites were noted, becoming very frequent two days later. The heifer was injected with trypan blue on the 8th day, when the fever was at its height, and the temperature fell to normal two days later.

An irregular reaction was noted from the 35th day, when the gall-sickness parasites appeared in fairly large numbers.

(*E*) *Heifer* 1219.—An imported English heifer, which arrived at the Laboratory on the 9th January, 1911. She was immediately placed in a tick-free stable. No abnormal records were noted during the observation period (9th January, 1911).

Treatment.—Injected on the 24th April, 1911, subcutaneously with 5 c.c. defibrinated blood of heifer 1216 and simultaneously with 5 c.c. fresh blood of heifer 1212.

Remarks.—A sharp rise in the temperature occurred on the 8th day, when the redwater parasites were recorded as very frequent; red urine was passed on the following day.

The heifer was injected with trypan blue on the 8th day, causing the temperature to regain normal limits on the 10th day.

From the 28th day to about the 40th day another reaction set in, during which the gall-sickness parasites were noted in rare numbers. They were also noticed at intervals after this reaction had concluded.

(*F*) *Heifer* 1214.—An English heifer, which arrived at the Laboratory on the 9th January, 1911. She was immediately placed in a tick-free stable and temperatured twice daily. No deviations from normal were recorded during the observation period (9th January, 1911, to 23rd January, 1911).

Treatment.—Injected subcutaneously with 5 c.c. defibrinated blood of heifer 1216 and simultaneously with 5 c.c. fresh blood of heifer 1212.

Remarks.—A temperature reaction set in from the 6th day, reaching 106·6° F. in the evening of the 8th day. The redwater parasites were noted at the commencement of the reaction, rapidly increasing in numbers until on the 8th day practically every corpuscle contained one or more parasites.

The animal was injected with trypan blue on the 8th day, but apparently it was too late, as the heifer died the following day of acute redwater.

RESULTS.

The simultaneous subcutaneous injection was followed in the first instance by the appearance of redwater, and secondly by gall-sickness. All the animals (except 1214) recovered from the redwater attack before gall-sickness set in. In the experiment with blood of heifer 1216 the redwater reactions were rather severe. They could, however, be checked by the injection

of trypan blue, and only one animal died; in this instance death could probably have been prevented if trypan blue had been injected one day earlier.

For practical purposes therefore, since the inoculation of redwater blood is not always quite safe, it will be advisable to control it, and to check it by the injection of trypan blue.

CONCLUSIONS.

The simultaneous inoculation of redwater and gall-sickness is both possible and practical. The animals recovered from the result of the redwater reaction before the gall-sickness reaction set in, which latter then took its usual course.

EXPERIMENT No. 6.—*To note whether animals which were inoculated in England with redwater could be exposed to natural infection shortly after their injection in South Africa with gall-sickness.*

(*A*) *Sussex Heifer* 1226.

First Treatment (England).—Had been injected with blood of an English heifer immune to South African redwater.

Remarks.—An attack of redwater followed, when the redwater parasites were present.

NOTE.—This animal arrived at the Laboratory on the 9th January, 1911. She was immediately placed in a tick-free stable and temperatured twice daily. No abnormal records were noted during the observation period.

(a) *Blood of Heifer* 932.

NOTE.—Heifer 932 contracted anaplasmosis as the result of the injection of blood of heifer 940 on the 27th May, 1910.

Second Treatment.—On the 23rd January, 1911—fourteen days after arrival—heifer 1226 was injected subcutaneously with 5 c.c. fresh blood of heifer 932.

First Test.—Sixteen days later, i.e. 8th February, 1911, this heifer was infested with blue larval ticks collected off animals at Onderstepoort immune against gall-sickness.

Second Test.—On the same date (8th February, 1911) this heifer was turned out to graze on land adjoining the Laboratory.

Remarks.—Irregular temperatures with high evening exacerbations followed. The gall-sickness parasites were detected in the blood thirty-one days after injection of blood of 932 (15th day of exposure), and increased in numbers during the following days, but were never very frequent.

By the 60th day after injection the temperature had returned to normal, and the engorged blue larval ticks had been collected in great numbers between the 39th and 50th days.

The heifer was kept on the pasture until the 3rd July, 1911 (145 days), when she was sent to Potchefstroom, and was still alive on the 30th November, 1911.

(*B*) *Sussex Heifer* 1227.

First Treatment (England).—Injected on four different occasions with blood of English heifers immune against redwater.

Remarks.—A reaction followed the first injection, but no parasites were detected in the blood until the 9th day after the second injection.

NOTE.—The animal arrived at the Laboratory on the 9th January, 1911. She was immediately placed in a tick-free stable and temperatured twice daily. No abnormal records were noted during the observation period.

Second Treatment.—On the 23rd January, 1911—fourteen days after arrival—heifer 1227 was injected subcutaneously with 5 c.c. fresh blood of heifer 932.

First Test.—Sixteen days later, i.e. 8th February, 1911, this heifer was infested with blue larvae the mothers of which were collected off animals at Onderstepoort immune against redwater and gall-sickness.

Second Test.—On the same date (8th February, 1911) this heifer was turned out to graze on ground adjoining the Laboratory.

Remarks.—Irregular temperatures with high evening rises followed; from the 29th day after injection the gall-sickness parasites were noted in rare numbers.

The ticks dropped in great numbers from the 23rd to 35th days after infestation.

The heifer was kept under observation on the pasture until the 3rd July, 1911, when she was sent to Potchefstroom, and was still alive on the 30th November, 1911.

(*C*) *Sussex Heifer* 1228.

First Treatment (in England).—Injected on two different occasions with blood of English heifers immune against redwater.

Remarks.—A reaction followed the first injection, but the redwater parasites were not detected until the 8th day after the second injection.

NOTE.—This animal arrived at the Laboratory on the 9th January, 1911. She was immediately placed in a tick-free stable and temperatured twice daily.

Second Treatment.—On the 23rd January, 1911—fourteen days after arrival—heifer 1228 was injected subcutaneously with 5 c.c. fresh blood of heifer 932.

First Test.—Sixteen days later, i.e. 8th February, 1911, this heifer was infested with blue larvae the mothers of which were collected off animals at Onderstepoort immune against redwater and gall-sickness.

Second Test.—On the same date turned out to graze on land adjoining the Laboratory.

Remarks.—Irregular temperature reactions with evening exacerbations were noted from the date of exposure.

The gall-sickness parasites appeared for the first time about the 35th day after injection, but never in large numbers.

The redwater parasites appeared on the 28th day after exposure.

Engorged blue larval ticks were collected in great numbers from the 23rd to 35th day after exposure.

The animal was kept on the pasture until the 3rd July, 1911, when she was sent to Potchefstroom, and was still alive on the 30th November, 1911.

(*D*) *Sussex Heifer* 1229.

First Treatment (England).—Injected three times with blood of English cattle immune against redwater.

Remarks.—A reaction followed the first injection, reaching 103° F. on the 8th day, and the following morning redwater parasites were found in very rare numbers.

NOTE.—This animal arrived at the Laboratory on the 9th January, 1911. She was immediately placed in a tick-free stable and temperatured twice daily.

Second Treatment.—On the 23rd January, 1911—fourteen days after arrival—heifer 1229 was injected subcutaneously with 5 c.c. fresh blood of heifer 932.

First Test.—Sixteen days later, i.e. 8th February, 1911, this heifer was infested with blue larval ticks whose mothers were collected off animals at Onderstepoort.

Second Test.—On the same date (8th February, 1911) the heifer was turned out to graze on land adjoining the Laboratory.

Remarks.—Irregular temperature reactions with evening exacerbations were noted from the date of exposure. A definite curve commenced from the 31st day after injection, when the gall-sickne s parasites were found to be fairly frequent. The lesions of anisocytosis and basophilia were also registered during the following days. Numbers of engorged ticks were collected off the heifer between the 23rd and 35th days after exposure.

After the gall-sickness reaction had finished, the parasites of redwater were noted on one occasion. The animal was kept on the pasture until the 3rd July, 1911, when she was sent to Potchefstroom, and was still alive on the 30th November, 1911.

(*E*) *Sussex Heifer* 1230.

First Treatment (England).—Injected on five different occasions with blood of English cattle immune to redwater.

Remarks.—No reaction followed until the 4th day after the fifth injection, when the temperature reached 103° F. in the evening, and the redwater parasites remained present from the 4th to the 8th days.

NOTE.—This animal arrived at the Laboratory on the 9th January, 1911. She was immediately placed in a tick-free stable and temperatured twice daily. No abnormal records were noted during the observation period.

Second Treatment.—On the 23rd January, 1911—fourteen days after arrival—heifer 1230 was injected subcutaneously with 5 c.c. fresh blood of heifer 932.

First Test.—Sixteen days later, i.e. 8th February, 1911, this heifer was infested with blue larvae collected off animals at Onderstepoort.

Second Test.—On the same date (8th February, 1911) this heifer was turned out to graze on land adjoining the Laboratory.

Remarks.—Some irregular temperatures with high evening records were noted soon after exposure; no definite reaction could be detected, but the parasites of gall-sickness were noted in rare numbers thirty-one days after injection. At intervals during the following days numbers of engorged ticks were collected off this heifer between the 23rd and 35th days after exposure. The animal was kept on the pasture until the 3rd July, 1911, when she was sent to Potchefstroom, and was still alive on the 30th November, 1911.

RESULTS.

The animals which were (1) inoculated in London against redwater, (2) after their arrival in Pretoria injected with gall-sickness, (3) infested with ticks sixteen days later, and (4) on the same date turned out on to the veld, went through a mild gall-sickness reaction, and survived any natural infection that might be conveyed either by the ticks artificially placed on or by the ticks which the animals picked up whilst grazing.

These results had to be expected, since the incubation time of gall-sickness when inoculated is shorter than when it is transmitted by ticks (in the latter case the shortest incubation time averages fifty-five days).

Accordingly, for practical purposes, animals which are inoculated with gall-sickness can shortly afterwards be turned out on to grazing ground with safety, always provided, of course, that the tick infestation on the grazing ground is not a gross one.

SUMMARY OF CONCLUSIONS.

(1) Two varieties of anaplasms (gall-sickness parasites) exist: one variety has been distinguished as *Anaplasma marginale* and the other as *Anaplasma marginale* (variety *centrale*).

(2) The distinction is based (1) on the different position the two parasites take up within the red corpuscle; (2) on the difference in size, there being slightly smaller individuals in the *centrale* variety; and (3) on the different virulency, the *centrale* variety having caused neither death nor any serious lesions.

(3) The *Anaplasma centrale* infection, transmitted by inoculation, in no instance caused the death of any of the English heifers. Accordingly an inoculation with *Anaplasma marginale* (variety *centrale*) can be made use of as a practical method of inoculation against gall-sickness.

(4) Animals which were immune to redwater could easily be infected with gall-sickness.

(5) Injected animals can be exposed to natural infection before the gall-sickness reaction has run its course. The anaplasmosis infection due to ticks having a long incubation time (55 to 100 days), will not develop severely in the inoculated animal, in which the disease runs with a shorter incubation time (16 to 40 days).

(6) All animals which have passed through an attack of gall-sickness and redwater conveyed by inoculation and exposed to natural infection for over a year are still alive.

(7) For the requirements of the conditions of South Africa, it is necessary to combine the immunization against gall-sickness with an inoculation against redwater.

(8) The redwater inoculation can be done before or after the gall-sickness inoculation, but it is practical to do both at the same time.

(9) The redwater, having a shorter incubation time, will develop first, and a recovery will usually be effected before the gall-sickness reaction sets in.

(10) In applying this method to the practice, it is necessary to keep the animal during the redwater reaction (about fifteen days) under close observation and to check any unusual reaction by means of a trypan blue injection, and whilst the animal is undergoing the gall-sickness reaction it will be advisable to feed them well, or keep them on the best pastures.

For the purposes of the practice, where the animals are inoculated against both diseases (redwater and gall-sickness), it has been arranged that only one injection will be necessary, the blood to be used being taken from an animal infected with both redwater and gall-sickness parasites.

The redwater reaction will be the first result of the injection of such blood, and it should be over in about fourteen days. Very careful attention must be paid to the redwater reaction in imported cattle; the gall-sickness reaction, however, will not require any attention, as it usually passes over unnoticed; for such imported cattle it will be advisable to keep the animals on the best pasture for the first sixty days after injection.

In the past, arrangements have been made to inoculate imported cattle against redwater in England, but the strain of gall-sickness has not yet been forwarded there, and any cattle inoculated in England with redwater, should be inoculated against gall-sickness after their arrival in South Africa.

All applications for redwater and gall-sickness vaccine should be made either to the Director of Veterinary Research, P.O. Box 593, Pretoria, or to the Assistant Director of Veterinary Research, Veterinary Laboratory, Grahamstown, accompanied with a remittance in prepayment, at the rate of one shilling per dose. Arrangements have been made at these centres for the dispatch of the blood so that it reaches the applicant in as fresh a state as possible. A telegram will be sent directly the blood leaves, and the recipient must inject the vaccine directly it reaches him. The dose to be given is 5 c.c., and it must be injected subcutaneously on the neck or shoulder with a hypodermic syringe. Be careful to see that the skin is perfectly clean at the seat of injection.

Experiments with Ostriches—XVIII.

THE ANATOMY AND PHYSIOLOGY OF THE OSTRICH.

A.—THE EXTERNAL CHARACTERS.

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The South African ostrich presents a large, compact, egg-shaped body or trunk covered with feathers, supported midway upon two strong, naked legs with double-toed feet, and bearing small wings against its sides. Narrowing behind, the body ends abruptly in the tail, while it is rounded in front where the long, snake-like neck, with a remarkably small head on the top, seems as if stuck on at a right angle. Set in the head are the large, steadfast eyes, the ear openings, and the nostrils, while in front it ends in the broad, flattened, horny beak.

Even among adults much variation occurs in size and general outline, partly dependent upon the strain and partly upon the nutritive condition; no constant differences in size or shape, however, distinguish the sexes. In a well-fed individual the outline of the body below is more rounded than above, the dorsal surface being nearly straight. Some strains narrow behind more than others. Poorly fed birds are shrunken at the hips, and nesting birds are often hollow below. No correlation appears to exist between the size or shape of the body and its feather-producing power; a small bird is just as likely to produce a superior plumage as a large one.

When the wings are at rest, the feathers flat and overlapping, and the tail drooping, the entire body appears to be covered with feathers, black and white in the cock, drab and white in the hen. But when the wings are outspread, the tail erect, and in hot weather each feather stands on end, a broad naked area, termed an apterium, is seen extending along the sides, continuous from the wing-pits and across the leg to the tail. It is thus seen that the feathers do not occupy the entire area of the body, but only suffice to cover it when lying flat and overlapping. The actual arrangement of the feather areas (pterylia) and the featherless tracts (apteria) will be described later.

On the under surface of the body a rough, naked, horny patch of skin underlies the rounded sternum or breastplate and helps to support the bird in front when crouching on the ground; a corresponding horny patch behind, covering the fused ends of the two pubic bones, affords a similar support to the hind end of the body. The front patch may be termed the sternal callosity, and the hind patch the pubic callosity. As the two callosities project somewhat beyond the general body surface, the crouching bird rests upon them in front

and behind, and also upon the sides of its legs, without soiling its under feathers by contact with the ground. Thus the entire weight of the crouching body is supported in front and behind and at the sides. A narrow featherless tract connects the two callosities.

At the hind end of the body, and completely hidden by the drooping tail, is the crescentic anus or cloacal aperture. Birds differ from mammals in having a common chamber behind, through which pass to the exterior the undigested food or fæces from the alimentary canal, the urine from the kidneys, and the reproductive products, eggs or sperm, from the gonads, ovary or testes, according to the sex. In mammals a separate opening, the anus, serves for the alimentary canal, and a distinct opening, the uro-genital aperture, for the urinary and reproductive products.

The discharge of the urine and of the dung are separate acts in the ostrich, whereas in most other birds they are voided after being mixed together. In the act of dunging or defæcation in the ostrich the tail is raised, and the opaque white or watery urine is discharged first and the dung or fæces next, the red cloacal and intestinal walls being also partly everted. At the same time the red corkscrew-like penis of the male is protruded, being attached to the floor of the cloaca. The male ostrich is one of the few birds provided with an organ of copulation or penis. It is a triangular, grooved thickening of the wall of the cloaca, bluntly tapering at its free end, and is represented in the female by a much smaller projection, the clitoris. The penis can be recognized even in newly hatched chicks, and is the only sure guide in distinguishing the cocks and hens at this early stage. It increases greatly with the advent of the breeding season, and, along with the cloacal walls, gives rise to a large protuberance under the tail, the size being a helpful indication of the sexual state of the bird. A less projection also occurs in the mature hen.

In pairing the cock mounts upon the crouching hen so that his right foot rests upon the back of his mate, somewhat to the right side, and his left foot is supported upon the ground. The curved penis passes down between the tail and the body on the left side, smearing the feathers on its way, and is inserted into the cloaca. The cock rolls from side to side and groans loudly as the act is consummated, while the hen snaps her beak and flutters her head from side to side.

THE NECK.

The neck of the ostrich is extremely long, slender, cylindrical, and of almost the same thickness, four inches, throughout. In some accounts it is described as naked and devoid of feathers, but as a matter of fact it is closely covered by small, down-like feathers, which become hair-like at their free ends. In the adult the feathers of the neck are much lighter than those covering the rest of the body, being a pale grey, almost white in some cases. A circle of white feathers usually occurs at the lower border of the true neck feathers, just before the neck is inserted on the body and the black contour feathers begin. Some writers regard this white border as a character separating the northern ostrich from the southern, but its occurrence is very general in the South African bird.

Usually the neck is held vertically, when it is about four feet long, the top of the head being from six to seven feet from the ground. As a result of the arrangement of the muscles and the form of the

vertebræ the neck is capable of twisting and turning in every direction, enabling the bird to look all around and to preen its feathers at every part of the body. When crouching, the neck may remain erect as if the bird were on the look-out; or it may lie prone extended upon the ground, especially when sleeping. In this attitude it never attempts to bury its head as tradition so persistently asserts.

Two shallow grooves, towards the right side, mark out the course of the gullet or foodpipe down the neck, and a swelling, passing downwards along this in a partly spiral manner, shows the course of the food in swallowing. In the characteristic "bromming" or "booming" of the cock, during the pairing season, the neck becomes greatly inflated by the filling of the foodpipe with air. The trachea or windpipe passes down the middle of the front of the neck, the gullet lying to the right of this. A blow on the neck with a stick, owing to the jerk which it may produce, is very liable to kill the bird from injury to the spinal cord.

THE HEAD.

The head is remarkably small for the size of the bird, indicating a very restricted brain capacity. It is set on to the neck at nearly a right angle, and is partly naked and partly covered with hair-like feathers, some of which stand out very prominently on the top of the head, as well as at the sides and below. The head is nearly flat above, but slopes forwards towards the broad beak. Some birds have a rounded elevation in the middle, which may be either naked or sparsely covered with small hair-like feathers. The North African ostrich has a horny patch in this region, probably corresponding with a naked patch which often occurs on the head of chicks in the South African bird.

At the sides, where the head joins on to the neck, are the large circular ear-openings, scarcely raised above the general surface, and almost hidden by a dense fringe of hair-like feathers. The opening leads into a deep, smooth-walled ear-tube, at the bottom of which is the drum of the ear. Like other birds the ostrich has no pinna or ear-flaps for catching and directing the sound waves.

Further forwards, and mainly at the sides of the head, are the large prominent eyes, with a steady unrevealing gaze. The iris is dark grey or brown and the pupil almost black. Both upper and lower eyelids are naked but edged with eyelashes, which are hair-like feathers. A third eyelid or nictitating membrane at times flashes across the eye from the inner corner and assists the ordinary eyelids in keeping clean the cornea of the eye. The closure of the eyes is carried out more by means of the lower than the upper eyelid, and the former is very liable to inflammation, especially in birds having access to the fruit of the prickly pear. The skin immediately in front of and below the eye is naked.

The beak is flattened, broad, rounded, and sheathed in horn, that covering the upper jaw being divided into a middle portion and two parts on each side, the whole forming the boundary of the upper jaw. The front and sides of the lower jaw are entirely ensheathed in horn, a middle and one lateral part on each side. Fleshy lips are never developed in birds. The nostrils are long, narrow, naked openings at the sides, nearly midway between the tip of the beak and the eye. A scroll-like projection from the upper inner surface can be seen within, and serves to increase the olfactory surface.

The size and entire structure of the organs show that the senses of smell and hearing are feebly developed in the ostrich, while that of sight is extremely keen.

The mouth can be opened widely by the depression of the lower jaw, and, as in all birds, is devoid of teeth, so that the ostrich is unable to masticate its food but swallows it whole. The grinding of the food, after being acted upon by the digestive juices, is performed in the gizzard with the assistance of small pebbles and grit. In a healthy ostrich the mucous lining of the mouth is a bright clear flesh colour, not pale and bloodless, when some internal derangement is indicated.

The tongue on the floor of the mouth is very short, blunt, and non-protrusible, and is supported upon the hyoid or tongue bone. At its root and in the middle hinder part of the floor is a circular opening, the glottis, about an inch in diameter, which leads into the windpipe or trachea. In swallowing, the sides of the glottis come together and close the opening to a slit-like form and thereby prevent the food from entering the windpipe. Except at the glottis the latter is always kept open by thin bony rings in its walls, and thus the air can pass freely to and from the lungs.

Behind and to the sides of the opening into the windpipe the mouth leads into the spacious foodpipe, gullet, or œsophagus. The walls of this are thin and fleshy and partly collapsed when the mouth is opened, and thus the tubular character is not readily recognized. For purposes of dosing ostriches, however, it is highly important to distinguish between the opening into the windpipe and that into the foodpipe, as many deaths have occurred as a result of pouring medicines down the " wrong way ". If poured down the trachea instead of down the gullet the liquid reaches the lungs and there sets up a disturbance. The first part of the gullet is pouch-like, and into this the food is collected as the ostrich eats quickly with its head down; then, the head being raised, the food is swallowed in quantity as a bolus. The upper part of the tube is median and then passes spirally to the right side of the trachea, so that the passage downwards of the food in lumps does not interfere with the breathing.

Towards the back of the roof of the mouth are the two nostrils or posterior nasal openings. These are flat openings through which the air breathed in by the anterior nostrils passes on its way to the windpipe. The right and left nostrils opening together produce a single V-shaped aperture. In the ostrich the correct course of the air in breathing is, as in man, through the nostrils, not through the mouth. It is doubtful whether the ostrich, like other birds, has much sense of smell in its nasal cavities. The actual nasal area is rather small, and the olfactory nerve or nerve of smell is feebly developed as is usual in birds.

Except when feeding on bush or trees the ostrich eats with its head downwards, and a quantity of food is first collected in a shallow pouch at the top of the gullet before being swallowed. When the pouch is full the bird raises its head and the food drops into the narrower part of the gullet. Once started on its way the peristaltic action of the walls of the tube carries the food downwards, even though the head be again lowered for feeding; the food is then actually moving against gravity. The bolus of food distends the gullet and can be seen travelling slowly downwards in a partly spiral manner; sometimes two or even three separate " swallowings " can be seen going

downwards at the same time when the bird is gorging its food rapidly, as when being fed on mealies. In drinking with its head downwards an ostrich appears as if shovelling the water into the back of the mouth; then, raising its head, it allows the liquid to drop down into the œsophagus.

THE LEGS AND FEET.

The legs of the ostrich are strong and powerful, well adapted for running and kicking. They come off from the body about the middle of its length, the weight of the body being thereby better balanced than if they emerged behind where the thigh-bone is joined with the pelvic girdle. The part of the leg corresponding with the human thigh is buried obliquely in the side of the body, and therefore is not seen from the outside. The thick, rounded, naked part of the leg, resembling the human thigh, and upon which the leg-brand is placed, corresponds with the human foreleg or shin. From this it is seen that the knee-joint of the bird, that is, the joint between the thigh and the shin, is close against the body, while the ankle-joint is raised some distance above the ground, not resting upon the ground as in ourselves. The part of the leg from the ankle to the toes is known as the tarsus or shank, and in front bears a single row of broad rectangular scales, numbering from thirty to thirty-five, which are dark brown in the hen and scarlet in the mature cock. It corresponds with the flat sole of the human foot, but consists of a single bone insteau ot five.

The foreleg or shin bears feathers on its outer surface in the chick, but they mostly disappear by the time the bird is adult. Its strong muscles used in running afford the only "joint" of meat available in the ostrich, and are sometimes cooked and eaten, or dried as biltong.

The foot consists of two toes, an adaptation for swift running. The African ostrich is the only bird with such a reduction in the number of its toes, most birds having four, while the South American ostrich has three. In the early stages of development of the chick within the shell it has been found that the normal five toes actually occur; hence we are justified in assuming that the ancestors of the ostrich were five-toed. The inner, clawed, and much larger of the two adult toes corresponds with the middle or third toe of five-toed animals, and the outer smaller clawless toe with the fourth. Like the nails on the human fingers and toes the large curved claw of the inner toe of the ostrich continues its growth throughout the lifetime of the bird, the tip being worn away by contact with the hard ground. By this means it keeps sharp and constitutes a powerful weapon with which the bird strikes in a forward and downward direction.

The under surface of the foot is covered and protected by a hard, greatly thickened pad, made up of peculiarly modified horny scales, narrow and vertically elongated, looking at the surface like the pile of velvet. The upper surface of each toe bears a row of enlarged scales, either continuous or discontinuous with those on the tarsus, and of the same colour; about twenty scales occur on the larger toe and ten on the smaller. Each toe is three-jointed. In some chicks a rudimentary claw is present on the small toe, but later disappears.

In the act of crouching the ostrich first drops downwards and backwards on its ankles, the tarsi being then parallel with the ground, as in the sole of our own foot. Often a bird will remain for some

time in this attitude and even attempt an ungainly walk. Next the bird drops further downwards but forwards, its forelegs becoming nearly parallel with the tarsi, the body resting on the ground at its sternal and pubic callosities.

The ostrich obtains a great leverage by having three long bones in its legs, and this accounts for the long, springy stride which the bird makes in running.

THE WINGS.

The wings are small in comparison with the size of the body and legs, and are altogether useless for flight, even if the loose feathers were adapted for the purpose. Ordinarily they lie against the sides, turned first backwards and then downwards. The inner surface is naked, the feathers being arranged in rows over the outer surface and along the sides. Each wing consists, as in our own arm, of an upper arm and a forearm, separated by the elbow, and is terminated by the hand, so hidden in the flesh that the fingers are scarcely distinguishable. The valuable wing-plumes are arranged in a single row along the hinder border of the forearm and the hand, the feathers coming from the latter being known as the primaries, and those from the former as the secondaries, terms much used in describing the plumage of flying birds but of no assistance in the ostrich.

The part of the wing corresponding with the human hand is imperfectly developed, having only three fingers instead of the usual five. The first finger or thumb stands out a little from the rest, and bears a few small feathers, constituting the bastard wing. A small curved claw occurs at the tip. The second finger is the longest and bears a large curved claw. A third finger is present, but can only be felt through the skin and never shows any trace of a claw. There are no hints of the fourth and fifth fingers.

When running, alarmed, or fighting the wings extend at right angles from the body, and the border bearing the large white plumes is turned upwards, instead of backwards and downwards. The arm is rather loosely attached at the shoulder and is often dislocated or put out of joint with rough handling. If lifted up, however, and tied across the back to the other wing for support it is easily replaced. Recovery is still more certain if the wings are placed in the "feather-protector" recently introduced.

THE TAIL.

The tail bears feathers on its upper outer surface only, the under surface being naked. They are arranged in a tuft, not fan-like as in most flying birds. The tail hangs downwards in young birds and hens, but stands erect or even inclined forwards in the adult cock during the breeding season. When plucked of its feathers the naked tail, the "pope's nose", is very short and stumpy, narrowing slightly where attached to the body. Near the root of the tail many birds have an oil or preen gland by means of which they oil their feathers in preening, which are thereby protected from water; but no oil gland is present in the ostrich, hence the readiness with which its plumes are soiled by water and wind, giving the bird a very bedraggled appearance. One thinks enviously of the delight with which a duck wallows in water and mud without soiling its plumage, while the feathers of the ostrich, not being oiled, are almost ruined under similar conditions.

COLOUR.

The general colour of the skin of adult ostriches is bluish-grey, blue being pronounced in the cock and dark grey in the hen. The purity of the colour, however, varies much according to the condition of the skin. Birds in full vigorous health, especially in spring-time, have a much clearer skin and the colour more pronounced than at other times; in a lower state of vigour the skin tends to be overlaid with epidermal scurf and scale, which obscures the true colour.

Cocks during the breeding season have the tarsal and toe scutellations scarlet, the intensity varying much and rapidly with the sexual vigour of the bird. In some birds almost daily variations can be noticed, and the colour is usually diminished in nesting cocks. The smaller scales on the back and sides of the tarsus are less intensely scarlet than the large scales in front, and in some the red coloration may extend above the ankle to the fore-limb. The beak and naked area around the eyes are of the same scarlet colour as the tarsus, and vary with it. During the non-breeding season the colour throughout becomes less intense. The tarsal scales of the hen retain the dark brown or dark grey of the young bird; rarely they become pale in colour like those of a cock before the scarlet is assumed.

In chicks the skin colours are alike in both sexes, being at first blue and then a rich yellow when the chicks are well fed and in full physiological vigour. The skin around the eyes is also a deep rich yellow, this being a good indication of a healthy condition. Within a year or so the adult skin colours begin to appear. After about the first six months the colour of the beak and the tarsal scutellations become irregularly pale yellow in the cock; they then change to pink, and from eighteen months onwards reach the bright scarlet of full sexual maturity. The age at which these sexual colour changes occur depends partly upon the strain and still more upon the nutritive condition.

In the North African ostrich the colour of the skin of the cock bird is reddish throughout, and of the hen yellow or cream colour like that of the chick of the South African bird. The foreleg of the latter birds shows some of the red or pink colour of the North African, and scars on the neck and body will often bring out the same tint.

TEMPERATURE.

The temperature of the ostrich, easily obtained by inserting a thermometer into the cloaca, is about 103° F.

THE AGE OF THE OSTRICH.

The question is frequently asked, to what age will an ostrich live? It can with assurance be replied: "We do not know." All evidence supports the idea that under favourable conditions and barring accidents and disease, the bird will continue to live to a good old age, probably a hundred or more. Indeed, an ostrich resembles many other animals of low mentality, such as fish and amphibia, and reptiles like the tortoise, turtle, and crocodile, in which we can hardly conceive of death ever being due to natural causes. Few probably owe their death to actual wearing out or loss of the vital powers, but rather to some accident or disease. After maturity is reached there is no bodily character which serves to indicate the age of the ostrich.

None of the birds at present under domestication have their history authenticated for the entire period, nearly fifty years, during which ostrich farming has been carried on. The oldest bird whose history is well established is one owned by Mr. H. E. Moss, Grahamstown. The bird can be traced for forty-two years and is still breeding, and produces a good crop of feathers. Another whose age is clearly established is a cock, "Old Jack", owned by Mr. Hilton Barber, Halesowen. He is now (1912) thirty-seven years old and still breeding, and growing a good feather crop.

It may therefore be regarded as established that an ostrich will breed until well over forty years of age, and as most animals are known to live a long time after their reproductive powers fail there seems no reason why an ostrich, barring accidents and disease, should not live for a hundred or more years. Under domestication he now leads a calm, placid, pampered existence, only disturbed two or three times a year for the purposes of dipping and quilling. His chances of life are greatly improved compared with those in his wild state, under which he was likely to fall a prey to the larger carnivora; as a set-off against this protection he is on account of his crowded condition more liable to attack from parasitic diseases, especially fatal to chicks and young birds.

Immunization of South African Born Cattle against Redwater from a Practical Standpoint.

By Wm. Robertson, M.R.C.V.S., Acting Assistant Director of Veterinary Research (Grahamstown).

It has long been known that one natural attack of redwater (*P. bovis*) confers a more or less permanent degree of protection upon a bovine; and that the use of blood from an immune, or salted, beast injected into susceptible cattle is a very excellent method of conferring protection upon them.

At this laboratory the issue of such immune blood has continued for the past ten years with most satisfactory results, and many owners of stock inoculate their herds before they move them from one part of the district to another as a matter of course. During the last four years I have issued 22,980 doses—a yearly average of 5745 doses.

Prevalence of Redwater in the District.

The district of Upper and Lower Albany has clean areas where no redwater has ever made its appearance, and in contradistinction has areas so grossly infected that it is sufficient for a susceptible ox to remain there only for a few hours to render infection certain. This is true of the commonage of this township, where it is certain death to turn out any susceptible animal even for a few hours.

Material Used to Give Protection.

The material employed to give protection is the blood from an immune animal, injected under the skin by means of an ordinary hypodermic syringe. In the yard, in tick-free kraals, are kept the bleeding cattle, and these have in many cases never been in contact with redwater infection (either through the attack of ticks or the medium of inoculation) for five years, yet, as a perusal of the chart shows, their blood can produce a distinct and typical fever curve, and give a distinct measure of protection to-day.

Method of Bleeding.

The method of bleeding is extremely simple, but as no preservative of any kind can be added to the blood very great care must be taken to exclude the possibility of contamination, and in the apparatus employed, the blood can hardly be considered as exposed to the air from the time it leaves the animal body to the time it is bottled.

The animal is cast and secured, and a log of wood inserted below the neck, taking care to rest on the jugular vein, thus bringing into prominence the jugular furrow on the upper side. The vein on this

Immunization of South African Born Cattle against Redwater.

Bleeding Redwater Ox; Canula in Vein.

side is raised by the pressure of the fingers, and a small incision made just through the skin with a sharp knife; through this opening is inserted a canula, attached to a flask, containing a little citrate of potash solution to prevent the coagulation of the blood; the flow is assisted by the use of a hand air-pump, producing a partial vacuum in the flask. As soon as sufficient blood has been drawn off the tubing above the canula is closed with a pinch-cock and the air-pump disconnected.

In bottling (the photo explains itself) a force-pump bellows is attached to the side arm of the tube, and a few strokes of the foot raises the air pressure in the flask sufficient to drive the blood up the glass tube into the pipette, from the nose of which it is drawn into sterile bottles and corked with sterile india-rubber corks.

THE METHOD OF INOCULATION.

This is much the same as with other vaccines. A clean, boiled, 10 or 20 c.c. syringe is required. The dose is 10 c.c. for large cattle and 5 c.c. for small cattle, injected under the skin in all cases. It is most important that the utmost cleanliness and care should be exercised in all the operations, as blood is a highly putrescent fluid and very liable to contamination.

KEEPING PROPERTIES OF THE VACCINE.

This vaccine is not like other vaccines, such as those for sponsziekte and miltziekte in cattle, and lymph for smallpox in the human subject, where the preparation can be kept within limits. In the case of redwater a vaccine over seven days old is quite useless, and may be dangerous. The date should be taken from the label on the bottle. Experiment has shown that blood taken from a salted beast, and kept clean, could with safety be inoculated into cattle daily for seven days. The animal inoculated by the blood eight days old showed no rise in temperature, and subsequent inoculation with virulent redwater blood proved that no protection had been conferred. It must also be borne in mind that once a bottle is opened the contents should be used at once, *certainly within twelve hours.*

EFFECTS OF THE INOCULATION.

These vary, partly due to the resistance possessed by the animal and partly owing to the strength of the vaccine used.

In a clean area or farm which is becoming invaded by the disease you meet all degrees of susceptibility amongst the cattle there—some are salted, some partly immune, others very sensitive to redwater infection. Thus in employing the vaccine on mixed herds of cattle great care should be taken that the inoculated animals can be under observation. Imported cattle are the most sensitive; then follows Cape cows from Malmesbury, Darling, and that part of the country; then the ordinary range cattle in varying degrees of susceptibility. The mortality—extending over 20,000 cases of inoculation—works out at under 1 per cent., and the percentage of deaths amongst uninoculated stock well over 60.

In susceptible animals the first sign of reaction is about twelve days after inoculation. The temperature rises up to 106 and 107;

Immunization of South African Born Cattle against Redwater.

Bottling Redwater Blood.

there is uneasiness, increased respiration, sometimes slight constipation, and great decrease in the milk supply. This reaction persists, more or less in severity, for a week; the temperature then falls, and the milk supply gradually returns—sometimes to its original supply, sometimes it is permanently diminished for that calving. There sometimes occurs a secondary rise about the thirtieth day. This secondary rise is due to the gall-sickness parasite (*Anaplasma marginale*) which may be present in any South African bred animal. Animals which pull through the first (rewater) may succumb to the secondary reaction (gall-sickness). Generally speaking, no treatment is necessary while the animals are undergoing the reaction. Feed lightly, house, keep out of the sun, leave them undisturbed, and if very constipated give a mild aperient dose of epsom salts—say, a pound for a cow, mixed with half a pound of black sugar in three bottles water—is all one can do. Highly susceptible animals undergoing severe reactions and showing symptoms of redwater may be treated with trypan-blue.

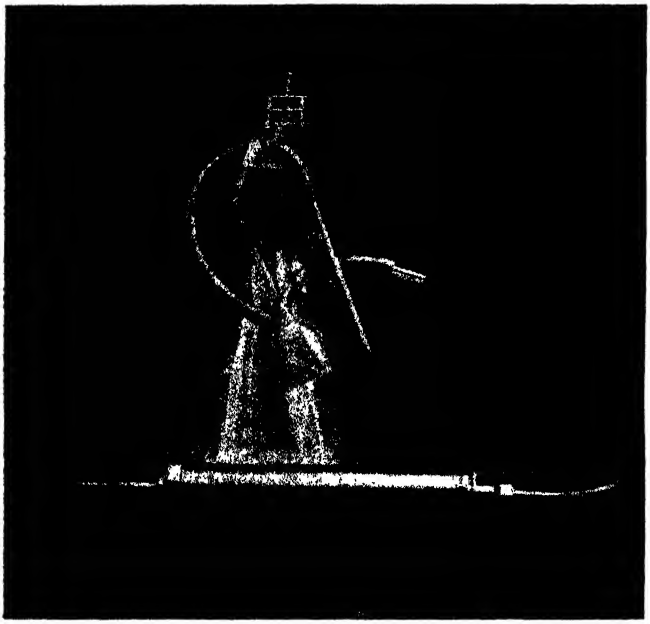
SELECTION OF SALTED ANIMALS FOR BLEEDING.

This requires very great care. Several farmers, led away by the published statement that "immunity to redwater could be conferred by inoculating the clean beast with blood from a salted animal", thought that any salted beast would do, and selected for the purpose one of their animals which they knew from personal experience had recently contracted and recovered from a genuine attack of redwater.

In many cases the use of such blood has been attended with the best results, and again, one or two very serious accidents have occurred. The blood being too virulent gave the disease to the cattle inoculated in a severe form, and killed a large percentage. Up to the present I have never been able to find—in what experiment has shown to be a suitable bleeding animal—any special phase or stage in the history of the *P. bigeminum*, the causal parasite of redwater, i.e. one which, when found in salted cattle, stamped them as safe to bleed and use their blood as vaccine. I have cattle which can confer immunity, but as far as parasites and intracorpuscular bodies are concerned give negative results to the most prolonged microscopical examination, and whose value as vaccine-making animals can only be demonstrated by the practical inoculation of their blood into clean cattle. As the blood of an immune animal may contain at the same time the parasite of gall-sickness (*Anaplasma marginale*), which causes a severe illness and sometimes death, care has to be taken to exclude this parasite, or to use only such blood as contains *A. marginale*, var. *centrale*, the mild form of gall-sickness.

The life of one of the vaccine oxen is a long one, and the resting stage of the redwater parasite—or to be more explicit the stage in which it confers immunity—extends over a very long period. At first (ten years ago) it was considered that the vaccine oxen required frequent and repeated injection with virulent redwater blood from a good case of the disease. That is, that they required to be *hyperimmunized*. This we no longer find necessary. In fact, the practice led to one or two accidents and consequent mortality. I have vaccine oxen who have never been in contact with redwater infection for seven years, and as a glance at their chart will show can produce a reaction and confer subsequent immunity of a high degree upon clean cattle.

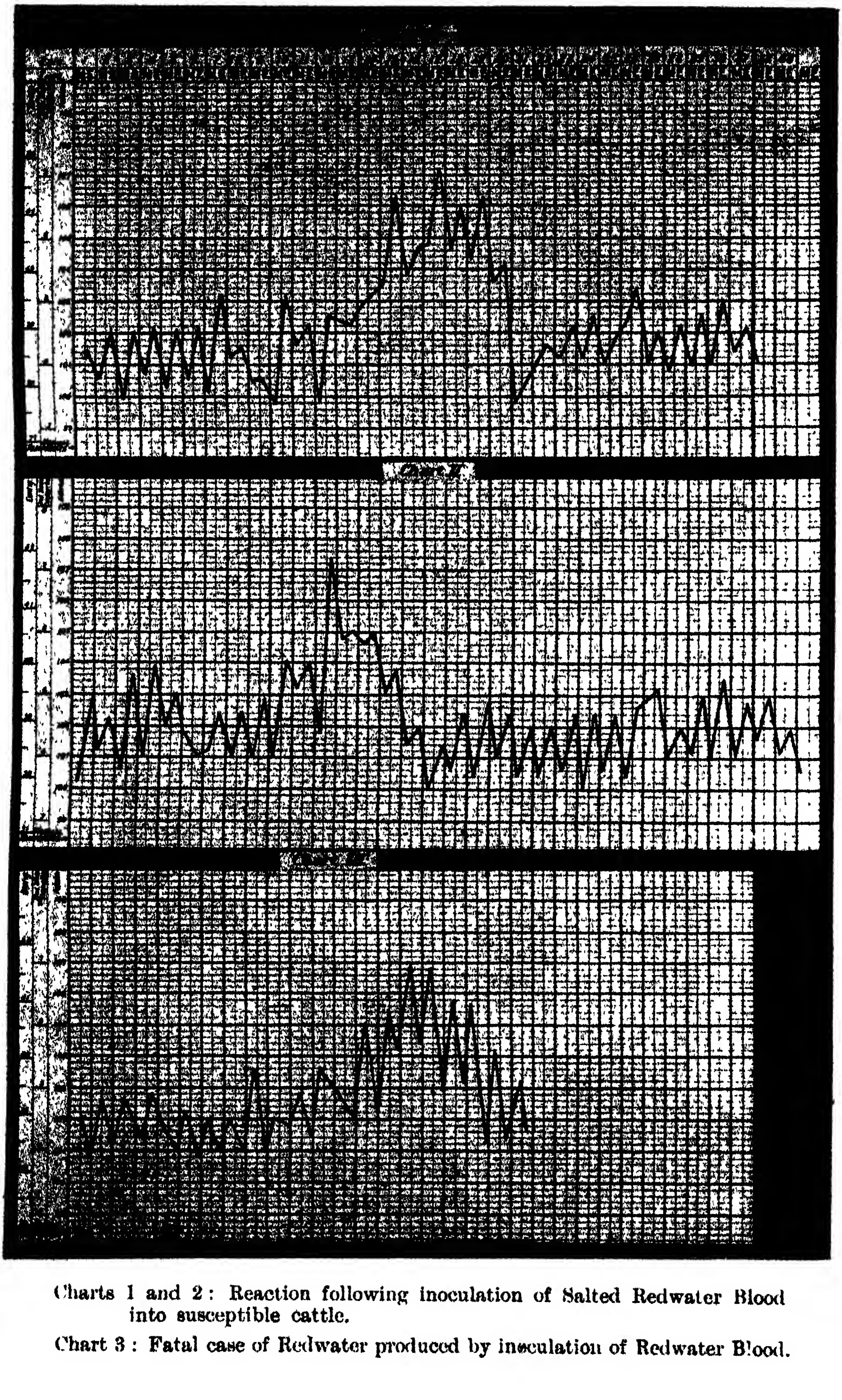
Immunization of South African Born Cattle against Redwater.



Bottle ready for drawing Redwater Blood, with Pump attached.

Bottle ready for sterilizing; Canula wrapped in cotton wool.

Immunization of South African Born Cattle against Redwater.



Charts 1 and 2: Reaction following inoculation of Salted Redwater Blood into susceptible cattle.

Chart 3: Fatal case of Redwater produced by inoculation of Redwater Blood.

It has also been shown that if one of these cattle alluded to above is herded for a day or two on a badly infested camp, where redwater is known to exist in the ticks, that it will show a severe reaction, a rise in temperature, and that subsequently its blood will be dangerous to use as a vaccine and may kill very susceptible animals, and such a bullock's blood may remain dangerous for several months and then gradually decrease in virulence until again suitable for vaccine.

DURATION OF IMMUNITY CONFERRED BY VACCINE.

It would appear that the immunity conferred by vaccine is very rapid and will resist simultaneous infection with virulent redwater blood or virulent infested ticks, and it has been shown on many occasions that the vaccine can confer protection if injected two days after infection; but if the latter has *three days'* start of the vaccine the animal will contract redwater. This statement is based upon many cases, as every cow or ox in this city (which grazes on commonage or paddock) must be inoculated or in time will surely succumb to redwater, and during the past five years I have had ample time and opportunity to verify this statement.

The duration of the immunity conferred by an injection of suitable vaccine depends upon the veld upon which the inoculated animal runs; if this is redwater tick infested the immunity will be permanent; if there are no redwater ticks the immunity dies out in about two years. Around this town this fact has led to some loss. Many farmers (redwater veld) have been dipping continuously and most conscientiously, and rid their veld to a marked degree of ticks. Some of these farmers inoculated their cattle two or three years ago; they now find that the immunity to redwater which their cattle formerly possessed is passing off, and if they propose trekking through redwater areas they must have their cattle reinoculated as a precautionary measure. Several men who make treks to the coast come in as a usual thing preparatory to leaving and have their spans reinoculated. The value of this was brought to my notice this summer in a marked degree. A farmer—a keen dipper—had inoculated his cattle two years ago, and was going into the Alexandria Bush to cut poles. While there every one of his two spans (eighteen in each), took sick, and two died with redwater. I inoculated his third span on the farm and sent it through, and not a single beast of this lot became affected.

CONCLUSION.

The preventive inoculation of South African born cattle against redwater is good. Without it farmers on the coast could never purchase cattle indiscriminately at stock fairs and have them inoculated as a matter of course, nor would transport-riding be attended with so little loss in the coast belt. The mortality attending carefully carried out inoculation is very small. In conclusion, I would advise all users to read with care the directions previous to use.

The Production of Milk:
Its Care from Udder to Creamery.

By W. M. A. Oosterlaak, Dairy Instructor for Orange Free State.

Milk is an exceedingly complex compound liquid or substance. Its secretion by the mammary glands in the udder of the cow has already been fully discussed and explained by scientists, but the true method of its formation is still unsatisfactorily explained; however, there are a number of practical deductions which show what is required and necessary to maintain a healthy flow.

Its composition varies considerably and depends upon the quality of blood in circulation and the action of the milk-producing machinery which is influenced by internal or external conditions. It has been proved conclusively that the composition of each pint drawn varies, in some cases considerably. The variations in milk as it comes from the cow are outside the acquaintance of most people.

The average composition of normal milk is:—

	Per cent.
Water	87.3
Butterfat	3.7
Casein	2.9
Albumen	.5
Sugar	4.9
Ash	.7
	100.00

The great variations in the composition are shown by Koenig by the following figures:—

	Maximum	Minimum
Water	90.69	80.32
Fat	6.47	1.67
Casein	4.23	1.79
Albumen	1.44	.25
Sugar	6.03	2.11
Ash	1.21	.35

These figures represent the maximum and minimum composition, except that the figures for butterfat are not quite correct. The writer has known cows to yield milk testing as low as .95 and as high as 7.1 per cent. fat, and records show tests even higher than this.

The above also illustrates that with milk rich in fat there should be a correspondingly high percentage of other solids.

The value of milk chiefly depends upon the proportions contained of the chief constituents, namely, fat, casein, and sugar. It is absolutely essential that every dairyman should possess a knowledge of the constituents of milk.

The most valuable as well as most variable constituent of milk is the butterfat, and this concerns us most at the present time. It constitutes an average of about 83 per cent. of butter, and is an indispensable constituent for butter and cheese production.

The density or specific gravity of butterfat at 100° F. is .91, and is quite constant. Its melting point varies between wide limits, the average being 90° F.

There are many agents and causes that influence the quality and quantity of milk; chiefly might be mentioned—

1. Breed and individuality.
2. Health and temperament.
3. Period of lactation.
4. Milking and treatment.
5. Cleanliness.
6. Feeding and stabling.
7. Season and water supply.
8. Mating period.
9. Cow and calf.
10. Management.

Breed and Individuality.—The yield and quality of milk fluctuate in different breeds, as also in cows of the same breed. The Jersey, Guernsey, and Shorthorns probably hold the list for quality and the Friesian cattle for quantity. Some "Africander" cattle—especially in districts with good pasturage—are also noted for quality, but the average number, in comparison, is very small. No insistance is made on any one particular breed and therefore not specially recommended, but what is certainly advocated is a good dairy herd, be this imported, thoroughbred, or crossbred, whichever suits best the purpose and conditions of locality. It is, however, essential that our dairying herds must be considerably improved before we can expect the success that the dairying industry deserves.

One notable source of ill-success in dairying is inferior cows, yet inferior milkers are not wholly confined to "scrubs" and common cows of the country, for they are also to be found among all breeds of pure and thoroughbred stock. Weak in constitution with the milking habit bred out, they transmit these characteristics to their progeny and thus become a source of danger and loss to the farmer who is trying to improve his stock. Gradual improvement throughout is, however, noticeable, and farmers and dairymen are realizing the enormous future success of the industry and the profits derivable from this source.

Health and Temperament.—Dairy cows are subject to many diseases which materially affect the production or quality of the milk. What might also be termed a "disease" are the too common errors of management and feeding which disturb the natural functions of the animal and cause disorder of the system. The farmer or dairyman should always be on his guard to avoid causes of disease. "Prevention is better than cure." Cows are usually healthy and robust, so a dairyman should know when his animals are doing well and be able to recognize the first approach of trouble. Sufficient attention

cannot be given to this. With a healthy digestion, good temper, and an absence of nervousness, fluctuations in the quantity and quality of milk will be less frequent. A nervous system and the least unusual excitement exercises considerable influence on the yield, the solids of milk, and the quality. Temperament therefore is the chief factor and should be closely studied.

The abusing of cows by dogs, the kicking, beating, and running, or ill-treatment of cows must be condemned. Cows should be petted instead, treated with kindness, and always kept in a quiet and contented condition, especially during milking operations. Dairy herds are very fine machines, requiring regular and most careful attention, and as such they should always be considered.

Lactation.—The composition of milk of all cows undergoes a change with the advance of the period of lactation. It is established knowledge that the quantity decreases and the quality increases with the advance of the period. The figures given below illustrate that the richness actually decreases during the first three months of the period; after this there is a gradual rise, and just before the cow dries up it may test as high as 5.5 per cent.

Month of Lactation.	Percentage of Fat in Milk.
1.	3.23
2.	3.11
3.	3.01
4.	3.13
5.	3.29
6.	3.46
7.	3.65
8.	3.82
9.	3.98
10.	4.16

Milking.—This is still a serious question in this country, and one that requires immediate and stringent improvement.

On most farms can still be seen the erroneous and injurious method of "pulling" the teats. In some instances this "pull" milking is so severe that the hind legs of the cow are removed from the standing spot. "Pull" milking is most disastrous to the yield and most injurious to the udder and glands. Not only does it cause pain and inconvenience to the cow but is also the cause of skin-cracks, tumours, fistulas, blind teats, and inflammatory conditions.

In milking the object of the milker should be to obtain the largest possible quantity from the udder without causing any inconvenience or annoyance to the cow or injury to her vessel. This can be done by "suction" milking. What is meant by "suction milking" is a steady and gentle downward pressure action of the hands, the motion of the fingers being consecutive, not simultaneous—and resembling mostly the tongue suction and pulsation in the mouth of the calf. This practice should be closely followed.

The following figures will illustrate how both yield and fat percentage are affected by "pull milking":—

Same cow, same conditions.

	Yield. Morning.	Fat.	Yield. Evening.	Fat.
"Pull milking" (native) ...	$8\frac{3}{4}$ lb.	3·6 per cent.	7 lb.	3·8 per cent.
"Suction milking"	$9\frac{1}{8}$,,	3·73 ,,	$7\frac{1}{2}$,,	3·87 ,,

This experiment was conducted for several days with several cows, the result being practically the same throughout.

A milker should endeavour to balance the udder, so to speak, taking away from each quarter sufficient milk to bring this about. When it is observed that certain glands are more active and appear to contain more milk at the outset of milking, the heaviest quarter should be reduced to bring them in unison with the less active ones.

Milking should be performed in a rapid, gentle, and effective manner. Pauses during milking are detrimental to yield. It is advisable to gently rub or "massage" the udder with both hands; this has a good effect and increases the yield by promoting a healthier and more vigorous condition of the glands. There can be little doubt that the milk is thus made very rapidly while the milking is going on, and the more rapidly milking is performed the more the glands are excited to action and the production of milk more satisfactory.

Stripping is a duty of special significance, and its necessity should be strongly impressed upon every person engaged in milking cows. Cows that are only partially milked yield poorer milk than when milked clean and completely.

The periods of milking should be at regulated intervals. The first jets of milk from the teat must not be milked into the pail, neither must it be used to moisten the hands or fingers as is the practice with many milkers.

A diversity of opinion still exists as to whether milking should be done with wet or dry hands. The writer favours milking with dry hands, and is of opinion—if the teats and udders are properly washed, etc.—that stripping of the udder is done more effectively.

The practice of milking with wet hands is not wholly condemned, but wet milkers generally neglect to adopt precautions to prevent contamination of the milk. The habit of dipping the fingers into the milk-pail to moisten or damp the hands and teats is a most objectionable one and should be strictly forbidden.

If milking cannot be accomplished with dry hands, then a small vessel of clean water should be available, into which the fingers of the milker could be dipped at intervals or when necessary. Fresh water should be used at each and every milking.

Before milking is commenced the udders and flanks should be washed and then wiped with a damp cloth, and the teats carefully washed and dried. This is a necessary precaution to prevent contamination of the milk with dirt and microbe life.

Cleanliness.—Thorough cleanliness must be observed throughout. At the present little consideration and attention is given to this all-important question; in fact, on some farms the filthiest methods still prevail, and milking is conducted in open kraals and yards or barns where sanitary conditions are entirely neglected, and the surrounding atmosphere polluted with manure, dust, bad and objectionable smells.

This impure air is breathed by the cows into the lungs and, carried through the passages of the lung tissue, is brought into contact with the blood-vessels, which absorb the air and discharge the load of impurities brought from every part of the animal's body. If the air is not pure the offensive matter is taken into the blood and some of the impurities in this fluid are retained, thus poisoning the very source from which the animal system is nourished. As milk is a direct product from the blood, the blood discharges its offensive load in part with the milk secretion, hence impure blood cannot make pure milk.

Where should cleanliness begin? With the cow. Cows should be carded and brushed very frequently, and washed at least once a month during the summer months and once every two months during the winter months. This is not only a precaution to cleanliness, but promotes a healthy coat and skin, and has an influence on the yield and quality.

Next the cow stables, yards, barns, and kraals must be kept clean and free from objectionable smells and odours. The stables and sheds must be thoroughly cleaned out every day. The walls, ceilings, manger, fixtures, etc., should be limewashed at least twice every year with a solution of the following:—Half a bucket of lime, 1 lb. common salt, 1 lb. soft soap, ½ lb. alum, ½ pint crude carbolic oil. Mix thoroughly into two bucketfuls of wash. All drains must be kept perfectly clean and sweet. Sawdust mixed with dry lime should often be sprinkled about the floors of stables, sheds, barns, etc.

The milker must be clean in his habits; his clothes should be clean and his hands washed thoroughly before milking each cow. The milking pail and all milk utensils must be scrupulously clean.

Feeding and Stabling.—The question of feeding milking stock more liberally is of vital importance, but this is still neglected. Hand feeding in the dry and winter months when nutritious pasturage is scarce, is imperative. The sooner we turn our attention seriously to hand feeding all the year round the better and more profitable to all interested in dairy farming. The importance of feeding dairy stock all the year round cannot be too strongly emphasized. In the best European dairying countries every inch of ground is turned to account for growing crops, and grazing paddocks are regarded as unprofitable. In this country our seasons, weather, and climatic conditions are so variable that we cannot depend on pasturage even during our summer months, hence the necessity of growing food and storing it for times of need. Pasturage and paddock food as the *only* support is most detrimental to the constitution of the strongest cow, and we cannot expect any improvement in our milking strains if these conditions—which at present prevail on the majority of farms—are permitted to continue. Besides, where no improvement is made in milking stock, there cannot be improvement in the raw product, and the advance and development of the dairying industry is thus seriously retarded. In contrasting the conditions of all foreign countries with those obtaining in this country, it is at once evident that we have immense natural advantages which, if turned to full account, would more than compensate any effort and expense. In all European countries the regularity of supply all the year round, regardless of weather—due to systematic feeding and stabling—is the greatest and strongest point of the system in dairying. Hand feeding, when done in conjunction with careful milking and close attention to other matters of importance, will increase both quantity and quality of milk from any and every milking cow, besides promoting a healthier body and stronger constitution in the progeny and younger stock.

A dairy cow requires and must be fed on a certain daily ration in proportion to her own live weight; at the same time individuality, nature, and purpose must be taken into consideration.

When fresh, sweet, and green pasturage is available for grazing during the day, the daily rations can be reduced considerably, but it must not be discontinued entirely. Foodstuffs should be wholesome. Taints in milk and cream have been traced to unwholesome and bad

feed. Feed at regular times before and after milking. Under or over feeding is most injurious.

There are times when the appetite of cows will fail from causes such as sameness of food, resulting in a reduction in quality and quantity of the milk. In such a case a change of diet or the addition of some food of agreeable flavouring will at once have a good effect.

The selection of suitable crops or feeds requires careful study. Some crops and feeds are more productive than others. Exactly what to grow for feed depends of course on the nature of the soil, but no matter how bad the soil, there are varieties of crops for selection which could be cultivated as feeds for dairying herds.

Very few crops or foodstuffs contain the constituents and components in the exact required proportion; therefore, to obtain the necessary proportions of protein, carbohydrates, and fat, we supply the cow as her daily ration with a variety of feeds and foodstuffs, and often have to mix together various foodstuffs.

To embody here a complete list of the various crops and feeds at our disposal for dairying stock, the respective qualities and values, together with a scale combining the exact proportions of such feeds, would occupy too much space. These subjects are dealt with in Transvaal Farmers' Bulletins Nos. 97 and 114, "The Feeding of the Dairy Cow" and "Cost Prices of Fodder Rations". Meanwhile, it should be stated that a special effort is being made by another division of the Agricultural Department to teach and educate farmers on the growing of suitable feeds and crops. Full advantage should be taken of this inducement, and all farmers ought to avail themselves of the benefits of the numerous experiments which have been conducted so successfully in this direction.

The erection of suitable, well-ventilated, hygienic stabling accommodation is absolutely indispensable, and the comfort of milking stock must be carefully studied if it is expected to obtain a remunerative return from milk or cream.

Stabling and sheltering of dairy stock are necessities sadly neglected. Milking cows must be stabled every night throughout the year, and must be protected, from cold in the winter months, and from flies, rain, heat, etc., in the summer months.

An excellent liquid fertilizer can be manufactured inexpensively on every farm from the manure, cows' droppings, and urine, and the residue is a valuable damp retainer for orchards, etc. The value of cattle manure is not sufficiently appreciated in this country.

Season and Water Supply.—The variable seasons and climatic conditions exert an influence on the milking properties of cows, and every effort must be made to minimize fluctuations in quantity and quality of the milk which takes place through this cause.

Purity of water also influences the quality and keeping properties of both milk and cream. Dam water soon becomes stagnant and contaminated, and practical experiments go to prove that stagnant and impure water lower the quality and keeping properties of milk. Many vexatious troubles and difficulties with milk have been traced directly to the impurity of water drunk by cows. If good milk is required, pure, clean, and cool water is indispensable, and a clear, cool, running spring is perhaps much preferable.

Mating Period.—When cows show a desire to mate, the excitability is so great that the flow of the milk is seriously interrupted.

This is noticeable more in warm weather or summer months. The flavour of the milk may also suffer as well as the yield and total solids.

A cow once safely in calf must be fed and tended in accordance with the new demands upon her system.

Cow with Calf.—Permitting the calf to run with or suckle on the cow is a source of danger to the milking qualities of dairying stock. The custom of allowing the calf to suckle immediately before and after milking should be discontinued. Calves should be taken away from the mother at birth and removed to a dry, warm, and healthy pen, here to be hand-fed and reared in this manner. The cow when once accustomed to this will not withhold her milk.

Management.—It is vain to anticipate improvement in dairy farming unless there is sound and systematic management throughout. The management in dairying on many farms is left entirely to natives. This is a too common error, and, as previously correctly styled, a "disease". Cautious and careful supervision in every little matter is essential. Regularity, too, in methods and every detail is of the utmost importance in the dairy, so must not be neglected.

BEESTINGS OR COLOSTRUM.

The "beestings" is the milk secreted by the cow immediately before, and for some days after, parturition. It is not essential here to deal with its composition, as usually the composition changes quickly after birth of the calf, and the milk becomes normal in character after the fourth or fifth day after parturition, but before the normal milk is suitable for creaming from six to eight days must elapse. It is stated by specialists that the beesting corpuscles do not disappear until about a month after parturition. Butter made from it has an orange-reddish colour, is soft, and soon becomes rancid. The flavour is decidedly "cowish". The beestings should be given to the calf from birth, as it contains medicinal properties which have a desirable action on the intestines besides containing a large percentage of albumen so essential in bone forming in the newly born calf.

Beestings must not be mixed with milk from other cows during the first six to eight days. It is well known that even the smallest quantity will injure the whole milk and destroy the flavour and quality of the cream.

THE CARE OF MILK.

The reader is referred to the table at the end of this article under the heading of "Germs", which summarizes the results of various researches that have been conducted in connection with dairy bacteriology.

Contamination.—We have to deal with the question of contamination before expressing methods and rules how the danger of contamination can be reduced or avoided.

Milk absorbs all odours and smells.

Decided taints in milk have been traced to objectionable smells, odours, drainage, and insanitary conditions. Every speck of dust or dirt contains microbes and bacteria which increase and multiply in milk with marvellous rapidity, so much so that in some instances the souring of the milk has already begun before the milk-pail arrives

at the dairy from the stables or barns. Contamination of milk generally occurs, notwithstanding precautions, but the risk should be reduced by every one. In the process of milking and the after-treatment of milk prior to reaching the consumer or factory, there is a lamentable lack of care and cleanliness. If milking were practised according to rules, and cleanliness more strictly pursued throughout, there should be no reason why contamination of milk cannot be avoided and all milk products manufactured in this country be of a healthier and better quality. No scientific treatment can make a good product from a bad raw material. Scrupulous cleanliness in every detail is obligatory. Few folk really grasp the importance and meaning of the word "cleanliness", and therefore cannot or will not appreciate or understand its value from a dairying point of view. It is from a want of knowledge of "cleanliness" and the causes of injurious changes in milk that farmers and dairymen entirely neglect to enforce thorough preventive means of reducing the risk of contamination. Therefore it is absolutely essential that cleanliness begin with the cow. In an address given by Professor Behring, of Marburg, Germany, at a meeting of the German Council of Agriculture, the following passages occur:—

"The milk of a normal milch cow, an ideal milch cow, kept under perfectly healthy and clean conditions, should contain no germs whatever. As a matter of fact, however, there are very few such normal cows in our cow-houses. We (Dr. Willem and myself) have carried out a great number of excessively troublesome experiments in Marburg, and have convinced ourselves that a cow may have a positively healthy appearance and yet yield an immense quantity of bacteria from her udder. There is no defect perceptible in herself or her udder, and yet in a sample of her milk sphaero-bacteria are found coming from one teat alone in such enormous quantities that this single cow is capable of spoiling the milk of the whole dairy."

The above is proof that perfect cleanliness should be made a constant study until it is so thoroughly a part of the daily life that a farmer or dairyman would no sooner milk a cow or handle milk or go about or permit the working in the dairy in an unclean condition or manner than he would go to a social gathering all unwashed and with clothes reeking with filth.

Flies and insect life also play a great part in the contamination of milk and the spread of taints in the dairy, for being, as they are, the carriers of germs, they come in contact with the milk and all utensils. This danger should therefore also be reduced. The risk of contamination and bad taints can be reduced by putting into practice the following rules:—

(*a*) Thorough cleanliness with cow.
(*b*) Thorough cleanliness in milking.
(*c*) Thorough cleanliness in stables, yards, etc.
(*d*) Thorough cleanliness of all utensils.
(*e*) Thorough cleanliness of dairy or room where milk is stored and freedom from objectionable odours.
(*f*) Purity of water.
(*g*) Freedom from taint caused by weeds and plants in feed.
(*h*) Skilled and careful treatment of milk before it reaches factory or consumer.

(a) and (b). *Thorough Cleanliness with Cow and in Milking.*— In the foregoing pages we have dealt with these questions, but the precautionary measures may again be repeated:—

1. Card, brush, and wash cows.
2. Milk after flanks and udders have been washed and wiped.
3. Milk after teats have been washed and dried.
4. Milk after hands have been washed cleanly.
5. Milk with dry hands if possible.
6. Milk in a clean place and into a clean vessel with strainer.
7. Be clean in manners and clothes.

There is nothing burdensome in carrying out these recommendations.

1. The cows could be carded, brushed, and washed, as already mentioned, in the forenoon immediately after milking.

2-4. A boy could precede the milkers and wash the flanks and udders and wipe them, at the same time carefully wash and dry the teats; this would leave the milkers free to do only the milking. The same person could provide basin and water for the milkers to wash their hands before each milking operation.

5. Where milking with dry hands cannot be accomplished, a supply of clean water for moistening the hands could be provided by the person who precedes the milkers. Never moisten the hands or teats with milk from the udder and do not dip the fingers into the milking pail.

6. See that the surroundings where milking takes place are perfectly clean and sweet and the milking pails scrupulously clean. Milk into a vessel containing a strainer.

7. It is recommended that all those engaged in milking should be provided with overalls, to be put on immediately before milking is commenced and taken off immediately after and kept in a clean condition. Milkers must be clean throughout in their habits. Young and old folk should be taught the value and care of cleanliness from beginning to ending, and the knowledge thus gained will enable them to appreciate the true value of dairying education.

(c) *Thorough Cleanliness in Stables, Sheds, etc.*, because taints have been traced directly to stables, sheds, or cow-houses which to the eye were apparently kept under clean conditions, nevertheless a smell arose from the single leaf of bad-flavoured food, besides many taints have been traced to the ground where the milk pails or cans have been standing during milking operations.

(d) *Thorough Cleanliness of all Utensils* is of vital importance and requires great care on the part of those entrusted with the work of cleansing. If sufficient washing has not been given, fermentation and decay quickly follow, and the supply of fresh milk is at once attacked by injurious bacteria, the milk immediately begins to sour or becomes tainted. In cleansing dairy utensils and appliances do not be too particular in the free use of boiling water to which has been added a quantity of soda in the proportion of about a ¼ lb. to 5 gallons boiling water. The cleansing procedure recommended is as follows:—

1. Thorough washing in clean cold water with a brush.

2. Thorough washing with boiling water and soda as above, scrubbing with a brush all seams and crevices both inside and outside of utensils.

3. Steaming or, failing this, thorough rinsing first in warm then in cold water. Utensils should then be placed reversed in a clean, cool, " draughty " spot to dry and ventilate. Before using again rinse thoroughly with clean cold water. Extra care is necessary that all seams of milk cans, pails, etc., are thoroughly cleansed. At most factories and creameries the milk-cans are cleaned and thoroughly steamed before return to owner, but in addition to this they should again be cleansed thoroughly to remove any bacteria or dirt that may have entered in transit or otherwise since cleaning at factory.

(e) *Thorough Cleanliness of Dairy or Room where Milk is Stored.*—The dairy should be scrupulously clean throughout. On most farms there is always available a suitable room that can be utilized as a dairy. The floors, however, are not always perfect. All floors should be concreted or cemented and washed out daily. The tables, benches, etc., must be scrubbed often with boiling water and soda. The walls should be limewashed three times a year with a solution of the following:—20 lb. unslaked lime, 3 lb. common salt, ¼ lb. alum. Slake the lime with boiling water until the consistency of wash is similar to rich milk, then add salt and alum, and stir thoroughly until dissolved and mixed. In and around the dairy the atmosphere must be pure and sweet, free from odours and smells. The entrance of flies is to be prevented. A wire gauze over the windows and a gauze inside door is advisable, at the same time admitting a free circulation of air, as plenty of ventilation is necessary.

Milk must not be kept or stored in stable or house lofts, nor in kitchen, pantry, or other living-rooms. Unfortunately the latter method still prevails on many farms. In fact the writer has witnessed the storing of milk and cream in bedrooms, stables, coach-houses, etc. —a most deplorable state of affairs that cannot be permitted to continue.

Temperatures act quickly on milk and cream, and not only cause deterioration but also an uneven distribution of fats and non-fatty solids. Therefore the dairy or storage room should always be kept cool.

(f) *Purity of Water.*—This does not only refer to the water drunk by cows as previously explained, but also to the water used for all purposes in and about the dairy. It is useless endeavouring to cleanse utensils and appliances with impure and stagnant water. Contamination is increased instead of being reduced.

(g) *Freedom from Taint-causing Weeds, Plants, etc.*—In previous pages it has been mentioned that taints have been traced to unwholesome and bad feed; therefore, there must be freedom from taint-causing weeds and plants, such as onions, cabbage, rape, and other strong-flavoured plants. The air impregnated with odour of tainted and decayed feeds, vegetables, and plants is not only injurious to milk and cream, but also to the breathing of cows, as such taints are conveyed, as previously explained, through the blood to the udder.

(h) *Skilled and Careful Treatment of Milk, etc.*—It cannot sufficiently be impressed upon farmers and dairymen the dangers and incalculable damage that arise through mixing with fresh milk—

(1) milk drawn from diseased cows, or cows suffering from diseased udders, sore and inflammatory teats, and the like;
(2) milk drawn from cows very much advanced in lactation;
(3) milk (known as beestings) drawn from cows after parturition, unless at least six to eight days have elapsed;

(4) milk already contaminated or too old;
(5) preservatives of any description.

Skilled and careful treatment includes—

(1) straining and filtration;
(2) aerating and cooling;
(3) protecting milk;
(4) conveyance and transport;
(5) separating.

1. *Straining and Filtration.*—The strainer most suitable for use is one containing a fine wire gauze and a good filtering medium which is pure, harmless, and taintless. Wadding, an innocuous cotton substance, specially manufactured for the purpose, is commonly used and recommended.

After milking operation, the milk must be taken immediately from the stable to the dairy—to avoid contamination it must not be left to remain in the stable or immediate vicinity; it is then weighed and the weights noted for reference, and at once *thoroughly* strained—preferably twice—through double " wadding " strainers, into larger and scrupulously clean vessels. It is then ready for either separating or aerating and cooling.

A piece of muslin, butter cloth, or similar material stretched over the milk can act as receiving vessel, or spread over a sieve, as is practised in most dairies, might suffice for the removal of insects, hairs, dust, and the coarser impurities visible to the naked eye, but does not purify and filter milk to any great extent or so effectually as the " wadding " filtering mediums.

2. *Aerating and Cooling.*—This is most essential and important to both farmer and factory, and is especially necessary in this country with a warm climate.

Aerating and cooling is compulsory in many countries, and it should be so here. It cannot be too strongly recommended, as the benefits arising are great, not only to the farmer but to the industry generally. In the milking of cows and cleanliness throughout stables, etc., there may, in some cases, be little to find fault with, yet the milk becomes sour and tainted through not being properly aerated and cooled. High temperatures act quickly on milk and cream, as explained previously, therefore it is necessary that milk should be kept at a temperature below 60° F.

Aeration and cooling, after thorough filtration, liberate repugnant and noxious odours, injurious gases, and arrest the development of bacteria, besides increasing the keeping qualities of milk.

Milk that is properly aerated and cooled—precautions in thorough cleanliness throughout being observed—will keep sweet for six days and longer.

In using a cylindrical milk cooler aerating and cooling can be done simultaneously. For these coolers it is claimed that they are able to cool milk within one degree above the temperature of water used.

Artificial cooling with ice cannot be entertained on the average farm, as the conditions are not always favourable to the practice. Cooling with ice is, however, carried out on farms in countries like Denmark where the climate is much colder than here. This precautionary measure is recognized by the Danes, who manufacture

some of the finest butter. This should be proof of thoroughly cooling milk in this country. Aerated and cooled milk must never be mixed with an unaerated and uncooled supply. In mixing sweet milks of different milkings it is advisable that both supplies are first heated to a temperature of 90° F.; each supply requires thorough stirring during the heating process. When heated and thoroughly mixed the whole is again aerated and cooled below 60° F.

The utilization of aerators, coolers, or refrigerators would well repay their cost, and are therefore strongly recommended to all persons engaged in dairy farming.

3. *Protection of Milk.*—The protection of milk after it has been filtered and aerated is a pertinent and important question. Dairies are usually exposed to high temperatures from direct sunlight and sweltering atmospheres which have a destructive influence on milk and cream. Places used for storage of milk and cream should therefore be kept cool, clean, and protected from dirt, moulds, and flies; at the same time light and ventilation must not be sacrificed; therefore special consideration should be given to the conditions under which the product is kept. Where milk after aeration is stored in the summer months and prior to reaching the factory, the writer would suggest that a heat protector in the shape of a jacketed covering should be put on to cans to reduce the temperatures. Such a covering could be made from felt, stout "sacking", or hessian cloth. The covering must be sewn up to the shoulder on the can. If the cans containing milk are then placed in a cool part of the dairy or storage-room, or in a direct draught of pure air and the covering frequently damped and kept moist with cold water, the temperature of the milk or cream can be reduced to about 50° F.

It is necessary frequently to stir the milk. Where this method of cooling and refrigeration is adopted the milk-cans should be covered at mouth, not with the lid, but with a piece of clean muslin cloth, preferably doubled, to exclude dirt, dust, etc., but which at the same time will permit of ventilation.

4. *Conveyance and Transport.*—In treating of this subject a distinction must be considered between (1) milk for consumption and butter-making, and (2) milk for cheese-making.

If milk is well filtered, aerated, and cooled, and providing thorough cleanliness throughout has been observed, and the milk duly protected, it may be dispatched a long distance and yet arrive in a satisfactory condition for consumption. Milk not aerated or cooled cannot be conveyed over distances of any length.

Another important factor in milk transit is the vehicles used. It is still a common daily practice of conveying milk and cream to factory and station in open carts and vehicles, with the direct rays from the sun playing on the cans; this is most detrimental and injurious. The cans should be jacketed as above suggested, and carried in a covered vehicle providing a cool ventilation. Carts or vehicles should be fitted with good springs to prevent continuous shocks and jolting, which causes agitation, in fact the churning of the milk. Milk thus conveyed may not have suffered to the extent that butter has formed, but it is questionable whether the yield in butter will not be considerably less if the milk is to be utilized for butter-making purposes.

For cheese-making purposes, it is apparent that milk must be transported only over very short distances. With milk intended for

rail purposes, square-shouldered milk-cans with ventilating lids are perhaps most suitable. For other purposes round cans with ventilating lids may be used, the wide-mouthed block steel seamless patterns being most desirable. The cans should be filled to the lower portion of the neck to avoid excessive shaking and spilling of contents, yet permit of ventilation.

5. *Separating and Creaming.*—The separating of cream can be done in several ways, the best being the manner in which milk is submitted to centrifugal force which has the advantage, because (1) the production of cream is brought about immediately, (2) the separation of the cream from the milk is so complete that not more than .1 per cent. fat is lost in the skim-milk, and (3) less labour and space is necessary.

For this purpose a variety of separating machines are available, as the growth of the dairying industry throughout the world has encouraged the manufacture of different kinds and makes. Farmers and dairymen probably become bewildered and find a difficulty in making a selection, but in choosing a cream separator they should be guided by efficiency of skimming and durability.

In this respect well-known makes have been tried and tested, and these have fulfilled all that is claimed for them by the manufacturers. It is therefore perhaps advisable to select a machine that has been fully tested and tried. Separators can be procured which will separate from 20 to 800 gallons per hour, and include hand-power, steam turbine, and belt-driven.

The remarks under this heading, though directed mainly to hand-power separators, apply equally to steam turbine and belt-driven separators.

On most farms separating is conducted in a very unsatisfactory manner, not sufficient attention being given to the minor details and to the important requirements of the machine.

So momentous are these that a full explanation is necessary. The chief points in separation which are worthy of most serious consideration are—

(*a*) Solidity of foundation and working efficiency of separator;
(*b*) condition of milk;
(*c*) speed of separator and inflow of milk;
(*d*) practice of separation;
(*e*) the uses of water and skim-milk before and after separation;
(*f*) alteration of cream screw;
(*g*) thickness of cream;
(*h*) cleaning the separator.

(*a*) *Solidity of Foundation and Working Efficiency of Separator.*—This directs attention to a faulty condition that is not of uncommon occurrence, and where it exists uniformity in skimming cannot be obtained, and variations necessarily result. The separator should be fixed securely and evenly to a platform that does not tremble or vibrate, as the slightest vibration affects the separation and causes variation and loss of fat in skim-milk. All parts of the machine must be in thorough working order, and the machine run as smoothly as a top; parts, therefore, must not be out of gear. All bearings should frequently be washed or cleaned with a little paraffin or petrol, and kept well oiled with a suitable separator or machine oil. A thick oil has a tendency to clog, causing jolting or jerking in working. The

slightest displacement of parts or works can usually be detected from the working sound by experienced operators.

(*b*) *Condition of Milk.*—It is universally recommended to separate immediately after milking when the milk has been properly filtered and strained. The reasons why this is so persistently advocated are

(1) The milk is in a very fluid condition.
(2) It is sweet and free from acidity.
(3) It is not heavy or dense.
(4) The fat globules are not dangerously grouped.
(5) The adhering power of solids and other substances of the fat is decreased.

In very cold weather, should the milk during filtration have cooled down much below animal heat, 80° F., it is advisable to heat same up to 90° F. before passing through separator.

Efficient skimming of cold milk is impossible, as the conditions are opposite to above. Results are also unsatisfactory when cold and warm milk are mixed together. This latter practice is met with frequently during the winter months, and should be discontinued, as the loss of fat in the skim-milk is a serious item. With milk kept overnight and separated the following morning, there is also a great loss of fat owing to acidity having developed, causing an increase in density and viscosity of the milk. In heating cold milk for separation purposes, it is advisable that this should be done *very slowly* to about 90-95° F. to obtain most efficient skimming, as the fats heat more slowly than the milk serum, which diminishes the difference between their densities. Practical experiments prove that with cold milk, if heated to a pasteurizing temperature (150° F.) and then separated, no extra loss of fat occurs. Remember, therefore, never to mix together hot and cold milks unless both have first been slowly heated to about 95° F.

Milk is cleaned to a certain extent during the separating process, but this must never be an excuse for non-filtration and straining as previously recommended.

(*c*) *Speed of Separator and Inflow of Milk.*—The speed at which the separator is run is of vital importance in separating. Generally, the speed of the machine is indicated by the manufacturers. The number of revolutions should, therefore, not be less than thus recommended, otherwise the skimming qualities of the machine are reduced. The speed of the machine must be maintained and never slackened throughout the process. Every dairyman should endeavour to obtain a uniform speed at every operation to avoid variations in cream tests; it is therefore advisable always to time the turning and carefully note the speed. With some separators it is claimed that the greater the speed the richer the cream, but this is not always advisable, as with rich cream there is always a correspondingly high percentage of loss of fat in the skim milk. The inflow of milk into the bowl should be continual, and the handle must not be released or the speed slackened because the receiver is empty; besides the inflow of milk must be regulated so as not to exceed the quantity the bowl is capable of treating, otherwise losses in fat will occur, at the same time underfeeding the bowl also causes loss.

(*d*) *Practice of Separation.*—In checking factory returns, much discontent and dissatisfaction results when variations in percentages of cream are noticeable. The argument usually advanced is "Same

cows, same separator, etc.", allowing that the milk is identical. Yet few dairymen or farmers fail to connect these variations in percentages of cream with the working and speed of the separator or the inflow of the milk. There is no desire to shield the factory or say the testing is infallible, but from actual experience there is no hesitation in stating that the fault lies to some great extent with the practice of separating. The working of the separator and turning of the handle is not sufficiently regular. Young people and natives are entrusted with this important duty without knowing the gravity of the work, and do not drive the separator at a steady and uniform speed throughout; thus the milk is not sufficiently exposed to the centrifugal force of the machine to effect proper separation. Where these irregularities exist, variations in cream tests will always result. Dairymen should, therefore, endeavour to obtain a uniform speed at every operation, and regulate the inflow to avoid variations in tests.

It is practically imposible for one person to do both feeding of receiver and turning of handle, so arrangements should be carried out so that the receiver is never permitted to exhaust itself. The speed should be got up gradually, and the milk should not be allowed to enter the bowl from the receiver until full speed is attained. With the smallest sized machine, the milk should be allowed to enter the bowl before full speed has been attained, otherwise the flow of cream will not be normal. Never stop a separator, but allow it to run down of its own accord.

(*e*) *The Uses of Water and Skim Milk before and after Separation.*—It is a good practice to fill the bowl with warm water before commencing to get up speed, as this not only reduces vibrations likely to occur when running an empty bowl, but also saves the mechanism and parts of the machine. After separation is completed it is advisable to run a quantity of skim milk through the machine to remove any cream that may be adhering to the plates or inside parts, after which warm water should be passed through to facilitate cleaning.

(*f*) *Alteration of Cream Screw.*—Most makes are fitted with a cream screw by which the thickness of the cream can be regulated. When a rich cream is desired the opening in the screw is turned towards the centre of the bowl, that is to say, the opening is closed, and for thin cream the screw is turned away from the centre and the opening made larger. If thicker cream is desired whilst separation is going on, and it is not desired to stop the machine to alter the cream screw, the result may be obtained by increasing the speed and reducing the inflow of the milk into the bowl, but this is not a practice to be recommended as it is likely to cause loss in fat.

In some machines the richness of cream is regulated by the rate of separation, but these machines are not so preferable as those fitted with cream screw regulators, especially in the hands of inexperienced operators.

(*g*) *Thickness of Cream.*—The proportion of fat in cream should not be lower than 40 per cent. and not higher than 50 per cent. In practice the quality of milk is the main factor which regulates the percentage of cream taken off in separating.

(*h*) *Cleaning the Separator.*—Under (*e*) it is recommended that warm water should be passed through the machine to facilitate cleaning. After this the machine must be taken to pieces and all

parts thoroughly cleaned and washed in boiling water to which a little soda has been added, care being exercised to remove grease and fat from all crevices, seams, etc., after which leave to dry. The cleaning should be done immediately after separation is completed and not left in abeyance until a "convenient" time during the day or shortly before use again. All separator parts, after washing, should be aired and not replaced in the machine until actually required for the next separating operation.

The amount of slime and dirt that collects and adheres on to the sides of the bowl—observed when the machine is taken to pieces—is to some extent proof of the unclean condition of the milk. Precautionary measures must therefore be taken to ensure greater cleanliness in future.

PASTEURIZATION AND STERILIZATION.

Pasteurization is frequently confounded with sterilization, which claims to completely destroy bacteria by the action of high temperatures. When milk is scalded above boiling point (212° F.) it is termed sterilization, whereas pasteurizating means heating of milk to 158° F., not higher than 165° F., at least this is Pasteur's process; 160° F. is the usual average. Pasteurization has, however, been carried to 180° F., but this must be considered the maximum degree without imparting a flavour of boiling. Milk treated at 160° F. has been found to retain the good fermentative and cell-forming qualities because most of the injurious and disease germs of the more common non-spore-making class which may possibly be present, are destroyed and killed. A temperature of 160° F., however, coagulates the albumen, the percentage of which in the milk is so small that it is of little consideration. The most important constituent, casein, fortunately escapes any perceptible injury; besides, the beneficial changes upon the particles of fat is to decrease their grouping influences and render the fat—the most valuable solid—in a more easily digestible form.

In sterilization the effect is detrimental to the milk solids as it decomposes the sugar, coagulates the albumen, partially decomposes the casein, and renders insoluble the lime salts—thus the fermentative qualities disappear. In hot summer months pasteurized milk will keep twenty-four or more hours longer than the untreated product if due precautions are taken against development of acid in the milk. Milk can be separated either at pasteurizing heat or cooled down to about 95° F. The latter is perhaps preferred, as it does not injure the separating bowl so much than at about 160° F.

An essential part of the pasteurization process is the immediate and quick cooling of the milk to 60° F. or lower. Sour milk containing more than 0.25 per cent. of acid will not bear pasteurization.

To the farmer or dairyman in a small way the cost of a small-sized pasteurizing plant is rather a large outlay and perhaps beyond the reach of many, yet it is most profitable in the end. There is no doubt that pasteurization if carried out on sound lines is a wise precaution, and would under existing conditions in our city milk supplies bring vast improvements.

Pasteurization removes all taints and flavours and produces a healthier product, more so than the ordinary aerating and cooling of milk.

ADULTERATION.

Adulteration of milk and cream is still of too common occurrence. It is at all times a dangerous practice and renders the necessity of a legal minimum standard in milk and cream and stringent legislation. Without any fraudulent intention some dairymen add water to arrest acidity in the milk and prevent it churning in the cans during transit, but even this is an objectionable practice and one that must forthwith be discontinued. With careful treatment of the milk these risks can be prevented entirely. Where milk is bought irrespective of fat contents a knowledge of detecting adulterated or watered milk is essential and indispensable to the welfare of the industry generally. Public interest also should be roused to the necessity of improvement of our milk supply, and the consumer should be the first to discourage the dairyman from committing an illegal offence, by refusal to pay a fair price for milk of poor quality.

GERMS.

It is not intended to enter upon minute or technical terms and explanations which are foreign to most people, but it is advisable to annex a list as a guide to ensure thorough cleanliness.

The following table summarizes the various immediate researches that have been conducted. In each case the number of bacteria is calculated as contained at per cubic centimetre:—

Infection—	
Freshly drawn milk in pail	6,600
Milk passed through six vessels	97,600
Cleanliness with cow—	
Milk from washed and brushed cow	9,730
Milk from brushed cow	20,600
Milk from unbrushed cow	170,000
In feeds—	
Cereal feeds (excluding moist bran)	2,000,000
Moist bran	4,201,000
Good straw and ensilage	7,500,000
Bad straw, etc.	10,000,000
Influence of feed on number of bacteria in milk—	
With cereal feeds	3,500
With moist bran	4,300
With good straw	7,350
Water, 7 grammes—	
Spring, fresh at head	322
Well water	1,760
Dam water	164,000
From a drinking-trough	228,200
Milking—	
Dry milking	5,600
Wet milking	9,000
First milk	10,400
Last milk	Sterile
Washed and wiped udder	1,200
Unwashed udder	4,800

Utensils—

Enamelled vessel (no cracks)	1,105
Galvanized steel vessel	1,690
Wooden vessel	279,000

Cleansing Utensils—

Sterilized pail (or bucket)	1,060
Sterilized milk-can	1,300
Washed-out pail	28,600
Washed-out milk-can	34,100

The results of research giving the number of germs which in five minutes fell from the air to the ground in an area of one square metre (= a square of 39 inch sides) are:—

In the open air	7,500 germs.
In clean cow stables	29,000 ,,
In dirty cow stables	69,000 ,,

Forestry and Plantation Work in Britain.

Notes by JAMES SIM, F.H.A.S., District Forest Officer, Kingwilliamstown.

INTRODUCTORY.

DURING my recent vacation, part of the time at my disposal was spent in visiting a few of the afforested areas in England and Scotland, studying the conditions under which forestry is practised, and the methods adopted, and I now beg to submit a report prepared from notes taken during the all too brief tours I was able to make. Many important centres had to be omitted, as the time at my disposal did not allow me to include them. I was, however, able to see some really good plantation work, as well as much that was poor and unsatisfactory.

ITINERARY.

I made my headquarters during my stay at Cults in Lower Deeside, and among other places visited the following are the most important:

(*a*) Lower Deeside: Aberdeen to Banchory, north-east Scotland; here the woods are mostly Scotch pine, larch, and spruce, with patches of hardwoods, oak, ash, and beech, and altogether a well-wooded area.

(*b*) Mearns and Forfarshire, north-east Scotland: The planting in this locality is largely shelter plantations, although good blocks of plantation occur here and there. The varieties are similar to those on Deeside, but the woods are inferior.

(*c*) Glasgow, west Scotland: Botanic gardens and parks. In this area conifers are exceptional, but fine hardwoods planted for landscape effect are seen in several of the parks.

(*d*) The banks of Loch Lomond: Luss and Tarbet, west Scotland. This area is justly famed for its excellent larch, which grown pure covers whole hillsides in all ages. Some excellent Scotch pine also occurs, and considerable areas of coppiced oak.

(*e*) Alnwick Estate, Northumberlandshire, north-east England. A week was spent here with Mr. A. T. Gillanders, Woods Manager to the Duke of Northumberland, and author of "Forest Entomology", who accompanied me over some very fine Scotch pine and larch plantations, and through the magnificent park where many exceptionally fine hardwoods, Douglas fir, silver fir, and others were seen.

(*f*) Chopwell Woods, Government property, managed by Mr. J. F. Annand, Lecturer in Forestry, Armstrong College, Newcastle-on-Tyne. Here the woods are nearly all hardwoods, with a mixture of larch, and a good deal of experimental work was seen.

(*g*) Wiltshire, Hampshire, and Gloucestershire, south England. I spent a few days at Grittleton, Wiltshire, and the neighbourhood. The country is flat, rolling downs, and appears well wooded, as rows of trees divide the fields of arable land; considerable areas of coppice, with standards of oak, ash, elm, beech, sycamore, and birch, are characteristic of this neighbourhood. Good clumps of larch were also seen in this locality.

(*h*) South Wales: This is a beautiful country, with a good deal of wood, mostly planted as shelter belts. I was only here one day, so had little time to study the conditions.

(*i*) Aberdeen, north-east Scotland: I visited the Lecturer on Forestry, Mr. Dawson, and discussed forestal questions, but time did not permit of my visiting plantations in his company. The college has only just acquired a piece of land for demonstration purposes and experiments, but as nothing had been done it was not visited.

I wished to include in my tours the forests of Ballochbuii, on the King's Balmoral estate, as well as the pine woods on Invercauld and other estates on Upper Deeside, also the well-wooded region of Speyside in Banffshire, and on towards Inverness, but was unable to do so. In several of these forests of Scotch pine and larch the management is said to compare favourably with anything to be seen in France or Germany.

GENERAL IMPRESSIONS.

The general impression in travelling through the country is that although such well-managed woods do exist they are few and far between, and that as a rule the production of timber, which is the primary object in forestry, has been considered of secondary importance. The considerations which appear to have carried weight in the laying out of the woods have been

(1) shelter for stock and agriculture;
(2) coverts for game and foxes;
(3) scenic effects;

and these impressions are in many instances confirmed.

In some parts of the country solid blocks of timber plantations are practically unknown, although hundreds of acres are planted in narrow belts; these are very useful for the purposes enumerated, but produce poor timber.

Well-managed plantations of considerable extent do, however, occur more frequently than appears at first sight, although altogether too few in a country in which thousands of acres are available and suitable for such valuable timber trees as larch and Scotch pine, although unsuitable for agriculture.

A mistaken idea is circulated in certain quarters that good timber will grow anywhere in Scotland. This has yet to be proved, and so far profitable plantations are seldom found at an elevation exceeding 1000 feet above sea-level.

OWNERSHIP.

Nearly the whole of the woodlands of Britain belong to private landowners, while an almost insignificant portion belongs to the State. Of the latter some is ancient heritage, which, although woodland, has never been really managed as forest, either sylviculturally or

economically, and a smaller part has been recently acquired for purposes of afforestation.

This appears to consist of several detached areas in Ireland, in extent about 5000 acres, and an area at Inverliever, in the west of Scotland, of some 14,000 acres.

These are now in the charge of trained foresters, and are being worked under carefully arranged working plans as object-lessons and experimental stations. Several of the colleges, as for example at Oxford and Newcastle, also have areas of greater or less extent which are used as training ground for the young foresters attending forestry courses.

PLANTATIONS ON PRIVATE ESTATES.

As has been said, the greater part of the woodlands is on private estates, and on a very large number of these the growing of timber cannot be called a success. Timber growing, it is said, does not pay, and little interest is taken in the plantations in many cases.

There is no doubt that the prices offered for much of the timber grown is not such as to encourage planting, but the fault lies more with the quality of the timber offered and the spasmodic supply than with the market.

On many estates there are no trained foresters, and, indeed, the limited amount of woodland on several of them makes the employment of competent men unnecessary. In these cases the woods, such as they are, are usually in the charge of a more or less intelligent working man, who frequently has other duties to perform, such as gardener, gamekeeper, or farm bailiff, and who often has not much knowledge of forestry. On many larger estates, however, good trained men struggle to manage the woods on sound principles, but under present conditions they struggle against heavy odds. Owners often take little interest in timber production.

In a few instances the landowners are themselves keen foresters, quite aware that in their woods they have a valuable asset, and all such employ highly qualified men. On these estates everything is carried out under well-considered working plans, and these isolated cases are sufficient to show that the country is capable of producing excellent timber.

Many landowners, having felt the stress of the times, are hard put to it for money, and the mature plantations on the estates are frequently sold, while no replanting is done.

THE STATE AND FORESTRY.

Government is moving slowly towards an effective scheme of afforestation. It already, as has been said, owns areas of land, some of which are wooded and some covered with grass, bracken, and heather. Trained foresters are at work on these, experimenting and testing their capabilities.

The Government has also voted considerable sums for the improvement of the rural districts, and forestry has obtained a small share, although no definite sum appears to have been apportioned.

ARBORICULTURAL SOCIETIES.

At the present time at least two societies, the Royal English and the Royal Scottish Arboricultural Societies, have a large and influential

membership and are doing much good work in pressing the claims of forestry upon Government and upon the country, and in procuring and arranging all available data with regard to management, cost, crops, and returns, with a view to future working plans. Experiments are made under their direction and the results compared and recorded. Continental tours are arranged at reduced rates to enable the members to study German and French forests under expert guidance, and last, but not least, a beginning has been made in a forestal survey of several counties to ascertain the available area of ground suitable for afforestation.

FORESTRY EDUCATION.

During the past few years a great advance has been made with regard to facilities for forestry education. Regular tuition in forestry and allied sciences is given at most of the Universities, where a sound forestry education can be had, and each training centre is year by year sending out considerable numbers of trained foresters; most of these men, however, go abroad, as remunerative and suitable situations are difficult to obtain at home. Small areas of woodlands are attached to some of these colleges and are used for practical training and demonstration. A great national want, however, is the lack of a large area of woodlands for demonstration purposes where the young men can receive a practical course. At present, to obtain this, it is necessary to go to the Continent.

The Highland and Agricultural Society of Scotland, the Royal Agricultural Society of England, and the Surveyors' Institution include forestry in their examination schemes; and examinations are set by practical men in forestry and allied sciences, and diplomas granted to successful students.

SPECIES OF TREES MOSTLY GROWN.

(a) *Conifers.*

Scotch pine (*Pinus sylvestris*) is the most largely grown conifer in all the mountainous parts of the country. It is the main forest crop in Scotland and the north of England, but is less successful in many districts in the south.

Well-grown large trees up to 3 feet diameter and 40 to 50 feet clear bole are occasionally seen, but 18 inches to 24 inches diameters are the ruling sizes in mature crops.

Larch (*Larix europea*) is largely grown and is one of the most profitable trees in localities suited to it. In many places the larch canker (*Peziza wilkomii*) totally destroys the crop or greatly injures it, thus rendering this tree a much less certain crop than Scotch pine. The timber is, however, more valuable, good larch being worth 1s. per cubic foot.

The finest stands of larch seen were at Luss (Loch Lomond), Dipton Woods, Northumberland, and on Deeside; good, fast-growing larch was also seen in Wiltshire, but the timber here was considered inferior to northern-grown trees.

Japanese larch (*Larix leptolepis*) is a fast-growing tree as compared with the European larch. I saw a clump at Alnwick, 25 to 30 feet high, eleven years old. It is said to be less susceptible to larch canker and its timber is said to equal the slower-growing common larch. It is so far only grown experimentally as a timber tree.

Spruce (*Picea excelsa*) is grown to a limited extent all over the country. Its timber is less valuable, but it is often used in mixtures

to maintain fertility, and pure patches are planted on places too wet for Scotch pine or larch. In many places it suffers from heart rot and has to be cut before maturity is reached.

Douglas fir (*Pseudotsuga douglassi*) does well in selected sites in many parts of the country. It requires sheltered positions to produce best results, so that it cannot be generally planted. Its rate of growth exceeds that of any other trees grown, while the timber is said to equal larch. Good stands were seen at Deeside, at Alnwick, and in Wiltshire, and its cultivation is extending. It stands a considerable amount of shade and is therefore sometimes used for underplanting.

Several other pines and spruces are grown, but to a much smaller extent, and the above are the principal conifers.

(*b*) *Hardwoods.*

Oak (*Quercus pedunculata*) and the Sessile oak (*Quercus sessiliflora*) are perhaps the most general and most valuable hardwood trees grown, more especially in the south of England. They form the basis of many mixtures on the best class of forest land, the mature crop being frequently pure oak. They grow slowly, and as the mature crop requires 150 to 250 years, they are less popular and less frequently grown than quicker-growing trees, which give practically the same value at 100 years.

Ash (*Fraxinus excelsior*) is a valuable timber tree and is grown wherever suitable ground is found. The timber is useful at any age, and even thinnings can be made into hurdles and other useful articles. It therefore makes one of the most valuable trees in the coppice, and coppices with standard systems.

Elm (*Ulmus campestris*) is as a rule rather small in Scotland, but grows very freely in the south of England, sucker shoots springing up everywhere. It makes fine timber trees, and very often forms the standards over coppice.

Wych elm (*Ulmus montana*) is very similar in character, and both these trees are frequently used for planting in hedgerows between agricultural fields.

Beech (*Fagus sylvatica*) is a good park tree, and straight stems have fair value, but its timber generally is not prized. It is one of the most valuable trees for maintaining the surface conditions in the forest, and for this reason finds a place in most mixtures. Frequently a few trees are interspersed in otherwise pure woods with the same object in view. It is also a valuable hedge plant.

Birch (*Betula*) is seldom planted, but is naturally present in nearly all woods. It frequently appears after felling pure Scotch pine. It is tolerated as it frequently fills gaps, and in young woods helps to produce early canopy.

Sycamore (*Acer pseudo platanus*), lime (*Tilia europea*), and many others are seen in groups or taking a place in mixtures, but unless for avenues and scenic effect do not possess great value, and the above are the hardwoods most commonly grown.

SYSTEMS.

Several distinct systems of sylviculture were seen, and may be classed as pure woods, mixed woods, grouped woods, and coppice woods.

(*a*) *Pure Woods*.—Any fairly large area planted with one variety or almost so is known as a pure wood, and many of the best woods in the country are of this description. Pure Scotch pine, or with a slight mixture of larch or beech, are common in Scotland and the north of England. Pure areas of larch are also common where canker is not prevalent. Patches of pure spruce and Douglas fir are common in soils which suit them. Hardwoods are seldom planted pure, although the final crop in many woods is almost pure oak. This system is seldom seen in the south of England. Its advantages are simplicity in management, and a large quantity of one class of timber in one area induces a better market for the produce.

(*b*) *Mixed Woods*.—Nearly all the woods in the south of England are mixed, and many all over the country. Shelter woods are almost invariably planted with mixtures, and although many of the mixtures are sylviculturally bad, and still more have been badly managed, good crops of sound, well-grown timber were seen in some of them. It is claimed that in mixture, trees are less liable to insect attack or fungoid diseases than they are in pure woods.

A very common mixture is Scotch pine and larch, with scattered beeches. The larch in its early stages grows faster and is apt to dominate the pines, but good crops often result. Cases were seen, however, of this kind where the larches were good, but the Scotch pines were only poles unsuitable for marketable timber.

Larch and spruce are also sometimes mixed and frequently with the addition of several hardwoods; one mixture seen at Alnwick may be given. The base of the mixture was oak and beech planted about 9 feet apart, and strong trees 3 to 4 feet used to give them a start. The area was then planted up to an espacement of about $3\frac{1}{2}$ feet $\times$ $3\frac{1}{2}$ feet or thereabouts with larch and spruce.

Mixtures of hardwoods are seen independent of conifers. Care is taken in forming mixtures that the trees planted may have approximately equal growth, so that in the struggle each variety can have equal opportunity. Trees of branching habit can sometimes be induced to form straight poles in mixture, and this feature is taken advantage of in arranging varieties.

(*c*) *Grouped Woods*.—This is perhaps the most popular method of the present day, and consists of carefully mapping out the area into patches according to the nature of the soil and on each patch planting pure groups of the variety considered most suitable.

The size of the groups is irregular, varying from a few trees to considerable areas. It is claimed that this system combines the advantages of both pure and mixed woods with the additional one of selection of soil for each species.

I saw this system in operation at Chopwell Woods (Newcastle College), where the ground was carefully mapped out before planting began.

The method suggests something patchy, and the system might be carried to excess, but its judicious application is usually satisfactory.

(*d*) *Coppice and Coppice with Standards*.—These are the prevailing systems in several of the south of England counties. The primary object in planting, no doubt, was for game covert, and, at the same time, timber and fuel. They are formed entirely of hardwoods which coppice freely and are at first planted closely so as to get a close

ground cover. The wood is cut over about every fifteen years, leaving only the standards which are 30 to 40 feet apart, and these may be elm, oak, or ash.

Ash forms the most valuable coppice, as fifteen years' material can be profitably used. I saw an area felled at Grittleton, Wilts, nearly all ash, which was being split into sheep hurdles, stakes, and other useful articles and the balance tied into fagots as fuel.

Where game is the main object, the coppice is often made up partly of elder, privet box, and other shrubs which have little value when cut.

Good coppice may be worth from £15 to £20 per acre at fifteen years, while a poor area may be dear at £2 per acre.

RATES OF GROWTH AND LENGTH OF ROTATION.

It was difficult to get accurate figures with regard to rates of growth, and such figures for any one place would have little value for another. It must be understood, however, that growth is very much slower than in any part of South Africa, and the following figures may be taken as a fair average of annual height increment.

Scotch pine gives 12 to 18 inches during its period of height growth, which is forty to sixty years, and mature crops are cut about eighty years.

Larch is usually quicker in its early years, but its height growth falls off later, and although useful timber can be cut at any age, it can sometimes profitably stand to 100 years. Douglas pine and Japanese larch frequently put on 2 to 3 feet per annum during their early stages.

Hardwoods are slower than conifers, and require longer rotations. Oak and elm require 150 to 250 years for a mature crop of heavy timber, while ash and beech can be cut as useful material in a much shorter period.

WORKING PLANS.

As may be anticipated, working plans, even of the simplest description, are practically unknown on many estates, and the work lacks regularity and continuity of purpose. Planting is spasmodic, resulting in patches scattered over the estates. Thinnings are irregular, and fellings very often regulated by the pecuniary condition of the owner from year to year.

The woods, however, on many private estates, on all areas attached to colleges, and on the State experimental areas, are managed under well-considered working plans drawn up for stated periods, usually ten to twenty years.

Some of these plans are simple in the extreme, the aim being to bring the woods into more or less age classes, and the regulation of the output by area, instead of by volume. These plans, however, prepare the way for more elaborate plans in the future. Others are more complete, but nearly all the proposals are more or less tentative, as the dawn of scientific forestry in Britain is of so recent a date that little data are available for the preparation of elaborate plans.

In such as came under my notice, a full description of the area and of the present condition of the woods constituted the larger part, and tentative proposals regarding its division into workable areas, regulated plantings, and fellings to bring the woods into regular age

classes, and its general management during the period covered by the working plan.

The varied conditions and requirements on estates renders it difficult to bring the whole woods under one plan, and, on some estates, it is proposed to divide the woods into two working circles, the one comprising all woods grown for merchantable timber for which a rigid plan for a period of years could be drawn up, and the other all woods laid down for specific purposes outside of actual timber production, and for this the working plan would be general and elastic, providing for current estate requirements. I did not, however, see this in operation.

PREPARATION OF THE SOIL FOR PLANTING.

On many estates the old-fashioned method of planting without almost any soil preparation beyond the partial removal of very rough shrubby herbage is still adhered to.

This method is, however, rapidly dying out, and more complete preparation of the soil as regards surface conditions is being adopted, and various methods up to complete trenching of the soil is seen.

Trenching is too expensive to be generally adopted and is only resorted to in special cases, such as landscape planting. A group at Alnwick Castle planted for this purpose showed growth which warranted the outlay.

For economic planting less costly methods are adopted. Ploughing the entire surface is occasionally, although not frequently, seen, and is growing in favour where it is possible.

A common method is the clearing of the heavy surface herbage by means of an implement resembling a kaffir hoe and planting with a spade on the cleared soil.

On moorland soil the spongy peaty surface is sometimes removed in sods for each plant which is put into the firmer soil below, and on all soils pitting is commonly done, especially for hardwoods, which are frequently put out at a large size.

The value of more complete soil preparation was very clearly demonstrated in an area of Scotch pine on moorland soil at Beanley Woods, Northumberland. The trees were about twelve years old and were divided into three plots.

No. 1.—The trees were simply notched in among a heavy surface of heather in the old-fashioned way. This plot was blanky, the trees small, and on many places the heather still flourishing.

No. 2.—This plot was roughly cleared of the surface herbage, and in doing so the surface soil was loosened and exposed. The trees were then notched in. This had few blanks, but the crop was iregular, some trees very good and others still small, with clumps of heather in places.

No. 3.—The surface of this plot was cleared of herbage, and a sod about 18 inches diameter and 3 inches deep was removed for each tree, which was then planted on the firm soil. The crop on this plot was very good, with few blanks, and the growth good and equal with a rich green foliage.

Unfortunately no record of the cost of these operations had been kept, but the result was striking.

PLANTING AND ESPACEMENT.

The espacement generally adopted is very similar to that usually given here, being about 3 to 3½ feet for Scotch pine and 3½ to 5 or even 6 feet for larch, spruce, Douglas fir, and hardwoods. In mixed woods the trees of the main crop are usually 8 to 12 feet apart, and subsidiary trees are planted to fill up to an espacement of 3 or 4 feet. In the system of coppice with standards, the standards are from 15 to 20 or even 30 feet apart, filled in to 2 or 3 feet for cutting as coppice.

The tendency at present (following, it is said, German precedent) is to plant a little wider with the view of gettting quicker growth and saving the first thinning.

The espacement is always slightly irregular as lines are never used, the distance apart being gauged by the eye. This reduces the cost of planting, and the result after the first thinning is very similar to those planted in exact lines.

In situ sowings, owing to the slow growth of the trees, are scarcely practical. I was informed that trials had been made at various places, but without success.

AFTER-CULTURE.

Cultivation of the soil after the crop is established is very seldom practised, being seen in only one or two instances, where rapid growth was desired for scenic effect. During the first year or two it is a common practice to mow the grass, bracken, or heather, so as to relieve the tops of the young trees and prevent their being choked out.

Blanks are filled up if possible during the first year, and the removal of double leads is frequently carried out simultaneously with the last mowing.

PRUNING.

Amongst conifers pruning is not much practised, thinning being so arranged as to make the operation unnecessary. In some cases, however, a light pruning of the lower branches and the removal of any double leads is carried out with the first thinning. This is common with varieties on which the dead branches persist. An excellent example was seen at Dipton Woods where a considerable block of Scotch pine was thinned and pruned to some 4 or 5 feet from the ground at one operation at a cost of 17s. per acre. A few rows on the outside are invariably left unpruned as a protective belt. With hardwoods pruning is more common, and both in mixed woods and pure hardwoods the removal of side branches and double leads is frequently carried out with the first or second thinning.

In parks and landscape groups pruning is a common and necessary operation, as the trees are more or less isolated and grown as specimens.

THINNING.

This is probably the most important operation with regard to a growing crop of timber. A good deal of diversity of opinion exists with regard to heavy or light thinning and whether the operation should take place frequently or at long intervals.

That many mistakes have been made in the past is very evident, and is generally admitted.

Many of the older woods have been spoiled by over-thinning. In these the trees are short-boled, branchy, and of little commercial value.

Other owners seeing the injurious effect of over-thinning have gone to the opposite extreme, and in some cases have delayed thinning too long or left nature to do the work.

With some varieties which are strongly light demanding such as larch, suppressed trees die back quickly and natural thinning does take place. With others, the struggle for dominance is so equal that a crop of tall, thin poles with no crown to carry on vigorous timber production is a frequent result. In all cases judicious thinning has produced better crops of useful timber.

Good examples of well-thinned pine woods were seen in Northumberland, and on one or two Deeside estates in north-east Scotland, and I had an opportunity of going closely into the question with Mr. Gillanders in the Dipton Woods.

The system followed there is admittedly one of the best, as the condition of the crops of pure Scotch pine at various ages testifies.

The trees are planted close so as to obtain early canopy and induce an early struggle for domination.

No definite period is prescribed for the first thinning. When a considerable number of the trees are seen to be falling behind in the struggle and most of the lower branches suppressed, relief is given by the removal of nearly all the dominated trees and the pruning away of the suppressed dead branches up to 4 or 5 feet. This leaves all the dominant trees, which, with the increased room, continue to grow vigorously. In this thinning the canopy is hardly interfered with, but the bottom and lower portions of the crowns are cleared, allowing a limited amount of light and air.

This first thinning usually takes place when the trees are twelve, fifteen, or twenty years old according to the condition of the crop.

The same process is repeated at irregular intervals as the condition of the crowns indicates. The removal of dominated and therefore useless trees so as to relieve the more vigorous is the system adopted in all the thinnings.

The struggle for room is desirable to induce branch suppression and to indicate the weaker trees which may be removed, but is never allowed to become so acute as to interfere seriously with the healthy growth of the dominant trees.

The crops seen after the first and several succeeding thinnings were in perfect condition, with clean boles and vigorous healthy crowns.

With mixed woods the same system is adopted and relief given as experience and common sense dictate. In this case, however, special attention is given to what is intended to be the final crop, and dominant trees of less valuable kinds have frequently to be removed to give these room.

The first thinning is really the most important, but is frequently neglected, as little or no revenue is derivable.

No hard and fast rule is laid down either as to period or espacement. The condition of the crop is the guide—bearing in mind that, in these days of creosote, a full crop of heavy, healthy timber fairly free from knots is more remunerative than finer material which can only be got at the cost of increment.

UNDERPLANTING.

Underplanting is seldom necessary in well-regulated woods, but is sometimes practised in woods which through accident or design have become too open. Many middle-aged woods in Britain contain a fairly large proportion of sound trees capable of producing good timber, and also considerable numbers which can never make good growth. In some cases such woods are cut clean and replanted, but in others the weedy trees are removed, the good, sound ones trimmed, and the area underplanted. Work of this nature was seen at various estates on Deeside and elsewhere, and I had the opportunity of discussing this question with Mr. Annand, Lecturer in Forestry, Newcastle College, in the Chopwell Woods, where he is underplanting as an experiment.

This wood is fifty years old, and consists of poor coppice oak and a slight mixture of other hardwoods with a considerable stand of excellent larch. The hardwoods are being cut out and the larches pruned to a considerable height.

The soil is prepared by hoeing off rough weeds and strong transplants of Douglas fir, Norway spruce, Sitka spruce, and *Thuya lobbi* is used with a mixture of beech to maintain soil conditions.

The espacement is irregular, but, roughly, about 6 feet, while seedlings and coppice oak, birch, ash, and sycamore, which are appearing all over the area more or less, are allowed to remain so as to make up a fairly dense crop. The trees look promising, but the work is too recent to allow one to judge of results. The first essential of this operation is that the thinning out should be fairly complete, as few trees can stand anything approaching dense shade. In this case the larches stand irregularly 10, 20, and even 30 feet apart, and everything else is clean cut.

Many old woods were seen underplanted with shrubby plants, elder (*Sambucus nigra*), privet (*Ligustrum vulgare*), box (*Buxus sempervirens*), flourishing currant (*Ribes sanguinea*), laurel (*Prunus lauro cerasus*), holly (*Ilex aquifolium*), and others for effect and to produce cover for game.

TREATMENT OF WOODS WITH A VIEW TO RESTOCKING.

No satisfactory method of inducing natural regeneration has so far been found applicable to British woods.

The ordinary methods of seed and regeneration fellings have been tried without success. A sprinkling of coniferous seedlings was seen in places, and frequently a fair stand of birch and sycamore, with a few ash, oak, and other of the better varieties. This is largely because of the weedy surface soil conditions.

It is difficult, owing to insect pests and other causes, to get a good stand on felled areas even with planting.

Where moorland conditions prevail, the surface soil under a crop of Scotch pine is a peaty, spongy mass, frequently overgrown with heather and blackberry in which seedlings, and even transplants, die off. At one place the plan of clear cutting, followed by several years' heavy winter treading by sheep and cattle hand fed on the ground, has been adopted. The result of this is satisfactory, and two important ends are effected:—

(1) The soft spongy layer is converted into a firm sod, the heather and blackberry trampled out, and the soil left in greatly improved condition for planting.

(2) The bark of the old stumps, which is the favourite haunt of the pine weevil (*Hylobius abietis*), is trampled off and the danger of damage to the young trees greatly lessened.

The same method is now being tried previous to felling. The first object is attained, and to lessen the danger from the second all refuse branches, needles, and turfs are burned on the stumps.

On other estates the area is left for several years after felling until it has regained its normal condition and then replanted. Sometimes the surface soil is cleared in patches for each plant at considerable cost so as to allow immediate planting.

NURSERY WORK.

The tree nurseries on the Alnwick Castle estates and at Chopwell Woods were visited, and in both the greatest care is exercised to ensure a supply of strong, healthy plants.

The position selected for tree nursery ground is usually in a gentle slope with a light loamy soil in which a good root system is developed, and which can be freely worked in almost all weathers.

The system of growing seedlings and transplants in tins is unknown. The seedlings are raised in beds and transplanted into nursery lines.

The growth of the young trees is slow as compared with the growth here, and transplants are seldom put out permanently until they are three or four years old, when they have developed hard wood and bushy fibrous roots.

Both in transplanting and in permanent planting great care is exercised (1) that the roots of the young trees are straight and not doubled, and (2) that all weaklings and malformed plants are discarded and destroyed. These precautions are considered very important. One forester, to shew that trees with doubled roots were the first to be dominated, had a number of the suppressed ones lifted for our inspection in a compartment being thinned. Certainly the roots of the trees exhibited appeared to point that the theory was founded on fact.

The seedlings are transplanted into nursery lines either at one or two years, and this operation is carried out in autumn or early spring, while permanent planting out is done any time during the winter.

Young trees may be kept in the nursery for several years longer if big plants are needed, but are transplanted every year, or every second year, so as to keep the roots bushy and compact.

Considerable stress is laid upon keeping the whole nursery cultivated and clear of weeds during the growing season so as to induce strong, healthy growth.

This system of nursery work might be more generally adopted here, especially for mountain and forest work, but transplanting with our quicker growth would require to be more frequent.

EXPLOITATION.

On estates where large quantities of timber are being disposed of, the woods to be cut are more or less roughly valued. They are then sold by auction or private tender to timber merchants who exploit them. In some cases the timber is sold by volume, but the cubic

contents are reckoned from the quarter girth, a method which allows about 25 per cent. for wastage.

The felled trees are either moved in the log to permanent sawmills, or cut up on the ground by a temporary mill.

I inspected a mill of this nature, which consisted of an ordinary ploughing traction engine and one portable saw bench, but the amount of work done by it was surprising. It was placed in the centre of an area of about 100 acres, and by means of a series of check blocks and a wire rope all the logs on this area were hauled to the mill by the engine itself.

On most estates a more or less elaborate sawmill is in use for the preparation of timber required by the proprietor or his tenants, and by this means not only matured timber but thinnings can be converted into useful material for fencing, shedding, hurdles, stakes, etc. Where a creosoting plant is established the small material becomes lasting and valuable.

The general idea that a creosoting plant is too costly for small properties or plantations is a mistaken one.

Three types of creosoting plants were seen, each suitable for various sized plantations.

No. 1 was a pressure arrangement, and consisted of a large tubular receiver, into which the timber is wheeled on small trolleys. Connected with this is a duplicate pump, driven by the steam engine attached to the sawmill. The pressure requires to be kept up only for two or three hours, and a considerable quantity of timber can be operated upon at once. This plant erected in England cost, exclusive of the engine, about £300.

No. 2.—This was a boiling process. The plant consisted of a boiler about 20 feet long, 6 feet wide, and 4 feet deep, with an oval or flat bottom built in brickwork over a furnace with a straight flue. The boiler is nearly filled with wood, and the creosote pumped in from a tank alongside, until the wood is covered. Fire is then applied, and the creosote kept gently simmering for about 18 to 24 hours, and allowed to cool off before the timber is removed. Excellent work was being done with this plant, which was erected at a cost of about £60, including a small crane for lifting the materials in and out of the tank.

No. 3 is a simple immersion, and all that is required is a receiver, a concrete or iron tank about the same size as the last, with a creosote tank and pump alongside. It is filled with timber, and creosote pumped in until the wood is submerged, and left to soak for a week or more. This process is slow, and not so thorough as the others, but the plant only costs £20 to £30, and does good work.

Creosote at present in England costs about 3d. per gallon, and approximately three-quarters of a gallon is used in the pressure process to every cubic foot of timber cut up into rails and fencing material.

Mr. Gillanders (who has under his creosoting plant charge of the two first-mentioned methods) states that the cost of creosoting is approximately 2½d. per cubic foot, or 1d. per fencing rail or post. All timber down to sheep stakes and droppers is creosoted, and pine timber so impregnated is said to last in the soil for 25 to 30 years.

PESTS.

The season of the year at which my visit took place gave little opportunity of seeing many of the injurious pests at work, but the

effects of several were very noticeable, and should, I think, be briefly referred to.

Squirrels.—A considerable amount of damage is done by these pretty little rodents, particularly in pine woods. They gnaw the bark in large patches round the growing tops of the trees, where the bark is still green, right down to the cambium. These wounds heal with difficulty, and even if the top is not killed the stem is weakened, and after a wind storm the ground is sometimes littered with crowns which have snapped at these places.

Rabbits.—Rabbits are very destructive to young plantations of all kinds, eating off the tops and gnawing the bark near the ground. It is usually necessary to fence young woods for several years with wire netting to keep the rabbits out until the trees are beyond their reach.

FUNGI.

Blueing of Timber.—This is caused by a fungoid organism, *Ceratastoma piliferum*, and is very common in timber felled and cut out in autumn before the sap is down. Timber cut in late winter or spring is less susceptible to attack. Blueing has been experienced in this country in pine timber, and experiments might be made as to whether the season affects it here. It is said to be specially common in pine woods which are unhealthy, such as those which have suffered from caterpillars.

Red Rot.—In some parts of the country it was difficult to obtain mature spruce which was not "pumped". The heartwood is decayed for a considerable distance up the stem, and the roots covered with a mycelium of a fungus, said to be *Trametes radiciperda*. This disease also attacks young woods, spreading on the roots from tree to tree and causing big blanks.

Agaricus melleus.—This is a common parasite on many trees. I observed it on Scotch pine in Kincardineshire, north-east Scotland, where large numbers of trees were killed outright by it. The characteristic brownish-black strands were noticed by the sawyers, who drew my attention to it. Like the *Trametes* the mycelium principally attacks the roots, the sporophores appearing round the collar.

Larch Canker (Peziza wilkomii).—This disease was seen in nearly all the larch plantations visited. In some it appeared only as occasional blisters with an exudation of resin, but in others, particularly where the larch was not growing vigorously, the trees, stems, and branches were covered with canker spots.

It was most noticeable in young woods 20 to 30 feet in height, and appeared to have less effect on older woods.

No remedy could be given for these diseases, except the removal of all trees seen to be diseased. With the *Trametes* and *Agaricus* the roots and heartwood may be seriously attacked before the trees are visibly affected, and therefore even careful removal of diseased trees may be ineffectual.

BOOKS AND PUBLICATIONS.

I had access to one or two good forestry libraries, and the following appeared to be amongst the best of the standard works bearing on forestry:—

"Forestry Entomology", by Mr. A. T. Gillanders, is one of the best works. It gives a general description of all the orders of insecta,

giving particular notice to those in which many insects helpful and harmful to the forest are found. Harmful species, as well as the damage done, are clearly described, and remedies given. This book should be in all forest libraries. It is fully illustrated.

"Veitch's Manual of Coniferae", second edition.—This is the best work I have seen on conifers. It is very complete and freely illustrated. It is obtainable from Messrs. Veitch & Sons, Royal Exotic Nursery, 544 King's Road, Chelsea, S.W.

"Elements of Sylviculture" (Bagneris).—This is a moderate-sized volume, putting the general principles of forestry in simple language, and would be a most useful book for foresters. Obtainable from W. Rider & Sons, 14 Bartholomew Close, London.

"Trees" (Marshall Ward).—This is published in six small volumes, and is really a small library on forest botany. It is obtainable at University Press, Cambridge.

"Seasoning of Timber" (Schrenck).—This is an American publication which deals fully with the various methods of seasoning timber.

CONCLUSION.

Before concluding it might be well to summarize points which appear to bear more particularly on our South African work.

OWNERSHIP OF FORESTS.

Almost all forests and plantations belong to private individuals, and, although they serve useful purposes, are, with exceptions, poor with regard to timber production.

In this country we encourage individual planting as much as possible, but unless some system of supervision or regulation can be imposed the result may be somewhat similar.

ARBORICULTURAL SOCIETIES.

These societies are doing much good work. The members meet frequently and discuss forest problems and annually make an excursion either abroad or at home to study methods and exchange ideas. There is ample scope for such a society in this country, and meetings of forest officers and others interested in one or other of the conservancies would help to broaden the ideas and advance forestry work in the country.

WORKING PLANS.

The want of working plans was very noticeable and regrettable. Here much of our work is in the initial stages, and, whether in private estates or in Government forests, should be regulated by well-considered working plans.

ESPACEMENT.

The method of close planting similar to ours has given good results, and although at the present there is a slight inclination for a greater espacement, this should, I think, be carefully tested before it is adopted to any extent.

Thinning.—The method described of thinning when branch suppression is fairly well advanced appeared to give excellent results. More harm was usually done by leaving the thinning too long than by beginning early and thinning lightly and often.

Underplanting.—Although most of what was seen was experimental it showed that the essential point was that the wood to be underplanted should be well opened out, even for varieties fairly tolerant of shade. This was well demonstrated in the Chopwell Woods.

NURSERIES.

The European system of raising the plants in beds and nursery lines is economical and might be tried in our mountains and forest nurseries. Greater care might also be given to the rejection of malformed and undersized seedlings.

CREOSOTING.

The simple plants for creosoting seen and described are not costly, and might be tried so as to give lasting quality to our quickly grown pine timber.

PESTS.

The amount of damage done by such pests as squirrels and rabbits was alarming, and too much care cannot be exercised to prevent their obtaining a foothold. There is also danger unless guarded against of introducing dangerous insects and fungoid pests.

BOOKS AND PUBLICATIONS.

The works mentioned are good standard books, and should, I think, be in every forest officer's library.

Some Facts About Camphor.

By Ambrose Warner.

Camphor is used principally in the manufacture of celluloid. The world's consumption is about 11,000,000 lb. annually, of which 70 per cent. is used by celluloid factories, 2 per cent. in gun-cotton works, 15 per cent. for disinfecting and deodorizing purposes, and 13 per cent. for medical preparations.

Japan, Formosa, and China are practically the only countries of export, and the Japanese Government supplies about 70 per cent. of the world's output. Germany and the United States are the largest importers.

The price of camphor, wholesale, on the London market has varied over the last ten years from 1s. 4½d. to 3s. 6d. per lb., but the lowest market price was only touched when several factories commenced making synthetical camphor which, however, proved not only too expensive a process but the camphor made had not the requisite properties, and it was also very highly inflammable, which resulted in several of the works being burnt down, and consequently all of them are now closed; there is therefore no competition to what is almost a Japanese Government monopoly.

The price in London to-day is about 1s. 6d. per lb.

Camphor is distilled from all parts of the camphor tree (*Cinnamomum camphora*) which is one of the most beautiful trees in the world, attaining a height of about 100 feet. Its home is in the Far East, but the trees have grown well in Ceylon, Malay Straits, Algiers, Florida, East Africa, and South Africa. A Government report from German East Africa states that from plants grown there, only two years old, the camphor oil only differed from the Japanese oil in containing a remarkably large amount of camphor much higher than the Japanese oil.

In Ceylon the trees thrive at all elevations from sea level to the highest mountains, and like a well-drained deep sandy loam containing good quantities of lime and potash.

The process of distillation is a very simple one, requiring no great amount of capital, and in the Far East it is done by the very lowest class of aborigines. In Japan the producers are by law bound to sell their output to the Government at a fixed price, which is a remunerative one.

In South Africa the profits on this industry with the price of camphor put at 1s. 6d. per lb. would probably amount to about £10 per acre after two or three years, increasing as the trees matured.

Care must be taken in securing the seed, as the Japanese have a way of "doctoring" it before it leaves the country in order to prevent it germinating; a favourite dodge is to kiln-dry it. The seed is about the size of a small pea and should be white and oily

inside, and the embryo should also be white and plainly visible. Seed that has been " doctored " is usually discoloured or the embryo dark in colour. Being an oily seed, the germinating power only remains for about six months, so care must be taken that the supply is fresh. It ripens about November, and it should therefore leave China not later than the end of December. It should be packed in slightly wet charcoal, as this has been found to preserve it better than any other substance. The Agriculture Department of British East Africa received some from Japan in 1909 in excellent condition packed in this way.

Propagation.—The seed should be put in water and left to soak for twenty-four hours. Those that sink are more likely to germinate than those that float, as the light seeds consist of little more than shells. The best seeds should be sown about 1½ inches apart in a bed of good soil well prepared by deep digging, well drained and free from drips off trees, the soil must be broken to a fine tilth and have sand added if it is not sufficiently porous. This is important, as the seeds take from seven weeks to three months to germinate, and they would be liable to rot if the soil held too much moisture. Sow ¼ to ⅜ of an inch deep, keep the beds well watered, and see that the soil is made firm but not tight.

In South Africa it would be advisable to erect a slight shed (open all round) to shade the seed-bed from the fierce sunshine. About 5600 seeds go to the pound, for which a space of about 4 square yards is necessary, and this should average about 2000 plants.

Transplanting.—When the seedlings are large enough to handle it is better to transplant to 6 inches apart and leave them until they are 12 inches to 24 inches high, then they should be finally planted out 4 feet by 8 feet apart in rows across the direction of the prevailing winds.

If let alone, in two years the trees should have attained a height of about 10 feet, but it is better to train them into the form of hedges about 4 or 5 feet high, and they can then be clipped four or five times a year with ordinary hedge shears. Only young stalks and leaves should be cut.

Yield.—Each bush should give about 14 lb. of leaves and stalks per annum. There would be about 1360 trees per acre, or, say, 19,000 lb. of " flush ". The minimum yield of camphor should be 1 per cent., or, say, 190 lb. camphor per acre valued at, say (only 1s. 6d.) £14. 5s.

Distilling is a very simple business. The natives of Formosa and Japan until recently used a hollow tree trunk with a wood fire burning underneath and water dripping on to it above; but of late years they rig up a wooden cask on a brick stove, put the flush mixed with water into it, light a fire underneath, and let water drip on to the top. In the lid is fixed some straw, and in that the camphor crystallizes from the steam.

Other methods for distillation are used, and all give satisfactory results so long as metallic substances, such as iron, are avoided, as these are apt to contaminate the camphor.

Careful experiments have been recently carried out, and the following details of one might be useful:—

5 lb. of young flush was put into a copper vessel with fifteen pints of water, and a glass dome luted on which was connected with a glass condenser. The water was heated slowly from below and a

thermometer placed so as to register the temperature two inches above the water and flush. At 50° C. (122° F.) crystals of camphor condensed on the glass dome, which at 90° C. (194° F.) were carried back into the water by the condensed steam. At 100° C. (boiling point) the steam and camphor vapour was passing rapidly into the glass condenser, while the leaves were covered with oily drops of camphor. Distillation at 100° C. was continued for two hours, when 7.93 pints of water, containing camphor and oil, had collected in the condenser. This was then passed through a wet paper filter to separate the camphor and oil from the water, 1.10 per cent. camphor and oil being obtained.

As a rule the camphor is almost entirely distilled once during three hours, and a strong smell of camphor is given off as soon as distillation commences.

Camphor when first distilled appears to be practically free from oil, but actually oil continues to sink to the bottom of the mass of crystals for some months unless it has been expressed by centrifugal force.

The Japanese camphor is imported into Europe in tubs covered with matting, each placed within a second tub secured on the outside by hoops of twisted cane. No metal lining is used, and the camphor has therefore some of its superfluous moisture absorbed by the wood.

In Ceylon the cost of pruning, distilling, and putting the camphor on the market does not exceed £3 per acre.

Camphor oil is largely used in the manufacture of soaps, and no doubt Natal could use large quantities of it at good prices.

The camphor retailed at the shops is often to a great extent mixed with other cheaper ingredients such as paraffin wax, and cannot always be taken as a guide to the nature of pure camphor.

The industry is one that is well worth trying in the warm and moister regions of the Union, and might become a valuable asset to the country.

Camphor trees, as is well known, make a very useful timber, largely used in the Far East for all sorts of purposes.

Preserving Perishable Produce.

By Robert Pape, ex-Superintendent of Dairying (Transvaal).

Though it is my intention to deal more specially with preservation of dairy produce, a more comprehensive title has been chosen, as the system I want to describe will serve equally well for the preservation of perishable produce generally.

But before entering upon the subject my special thanks are due to those who, by acting as my voluntary assistants and undertaking the daily supervision of the experiments, by attending to the chamber, and taking charge of the daily observations and records, made it possible for me to carry out an experiment which, without the assistance of persons thoroughly at home in the technicalities of treating dairy produce, would have been impossible.

The experiment commenced on 27th April, 1910, when some freshly made butter, a preserving jar with fresh milk, a preserving jar with fresh cream, and a few cheese were deposited in the chamber. The butter, milk, and cream were obtained under "farm conditions", i.e. conditions under which every dairy farmer in the Transvaal can work without incurring excessive expense. The butter was made from raw unpasteurized cream, and contained no salt or any other preservative. Cream and milk were unpasteurized and contained no preservatives.

The object was to test the preservative properties of the Mederer Preserving Chamber at Johannesburg; hence, beyond the ordinary care and cleanliness in production, no special precautions were taken to enhance the keeping qualities of the dairy produce used for the test. If the milk had been drawn with special precautions so as to secure "hygienic milk", if the cream had been pasteurized, and a preservative incorporated into the butter, I do not doubt that the produce would have kept longer than it did. But these precautions would have militated against the purpose of the test, i.e. testing the preservative effect of the chamber. Further, the temperature of the chamber was kept fairly high; frequently this registered over 50° F. A lower temperature would no doubt have tended to preserve the dairy produce for a longer time, but it was less suitable for investigating whether any preservative action must be ascribed to the chamber itself or whether the preserving effect was simply due to the low temperature.

Much as I desired to be present at the beginning of the experiment, I was prevented from attending by certain circumstances, but the results of my first inspection showed that the dairy produce must have been in good condition when it was placed in the chamber. On 20th May I visited the chamber, and the result of my investigations was as follows:—

Milk and Cream.—In both cases the liquids have separated, a white sediment has formed, then follows a layer of serum, and on top a compact layer of somewhat tough cream. The cream was perfectly sweet. The butter was still in excellent condition. The

cheese was ripening "normally". In order to illustrate the full meaning of this I should add that it was the first time I entered a cheese-curing room in South Africa where I found "normal ripening of cheese". As a general rule my constant observation has been that the moisture in the cheese evaporates too quickly, which materially impairs the quality.

Thus for twenty-three days the chamber had kept milk, butter, cream, and cheese in perfect condition at a temperature varying from 42 to 58. This in itself is sufficient to demonstrate the suitability of the chamber for dairy purposes. But the experiment was continued. Mr. Mederer contending that it was possible to keep butter and fish in the chamber without running the risk of contaminating the butter with a fishy flavour, I decided to make the experiment.

Some fish were placed in the chamber, and one lump of butter coated with mould. The fish were hanging over the butter, the mouldy butter was placed next to the fresh butter. This was a severe test, as it gave the butter every chance of being contaminated either with fishy flavour or by mould.

I again inspected the contents of the chamber on the 15th June. The fish had turned into natural cod fish; no smell of fish was observed on opening the chamber. The mould on the particular butter had almost disappeared. The fresh butter showed no mould nor any taste or smell of fish. The fresh butter was not wrapped in parchment paper. The butter had ceased to be fresh by this time; it was decidedly oldish, the outer layer was a deep yellow, the under layer whitish. The jars of cream and milk showed distinct evidences of bio-chemical changes. On top of the cream was a vegetation which I took to be *Oidium lactis*; at the bottom of the jar some gas-producing germ was noticeable. The cream in both jars was slightly sour. The cheese seemed to be ripening normally, if somewhat slowly.

As the outside temperature was the same as the temperature in the chamber, the door leading to the chamber and the lobby door were left open. As a result the smell of fish was noticeable in a few minutes' time. From the reports I take the following:—

April 27.—The produce was placed in the chamber under the following conditions:—Wind east. Outside temperature 60° F. in the shade. Sky clouded; cool. Lobby to chamber 52° F. Chamber 50° F.

May 14.—Milk: Separated, with clear edges. Cream: Liquid; heavier substances; sweet. Cream: Ditto. Butter: Hard; smell fresh. Cheese: Damp and soft, not splitting. No salt crystallization. The cheese in the dairy is hard. Chamber without smell.

June 3.—Butter: Unchanged. Old butter: The yellow and blue spots have disappeared; the black spots turn grey and diminish. The rancid smell has gone. Milk: Unchanged. In the open tubes the cream is hard. Cheese: Ripens normally. Those in the lobby ripen well at a temperature of 55-60° F. Fish: Since 30th May the fish have changed into mummies; fresh; no smell. Chamber: Under all circumstances no smell.

June 9.—Milk remains unchanged. The casein has become very compact and splits at the bottom like curd. Cheese: Quite yellow; feel damp. Butter (fresh): Smell good; turns somewhat paler under the surface. During the experiment about 10 gallons of water were sprayed twice daily in the space between outer and first inner wall,

making the daily water consumption 20 gallons. The following is the daily record of temperatures:—

LIST OF THE VARIOUS TEMPERATURES TAKEN IN THE MEDERER CHILLING CHAMBER FROM 27TH APRIL, 1910.

Date.	Weather.	Wind.	Temperatures.			
			In Chamber.	In Well.	In Sun.	In Shade.
			° F. C.	° F.	° F.	° F.
April 27..	Cloud	E.	50·10	52	70	60
„ 28..	Clear	N.E.	52·11	52	72	62
„ 29..	„	S.E.	50·10	52	70	60
„ 30..	„	S.E.	50·10	53	74	66
May 1..	„	S.E.	52·11	52	78	66
„ 2..	„	S.E.	57·13½	52	78	66
„ 3..	„	N.	55·12½	55	72	64
„ 4.	„	N.N.W.	52·11	55	64	58
„ 5.	Clouded	N.W.	55·12½	55	69	64
„ 6..	Light clouds	W.	54·12	54	76	66
„ 7.	Clear	W	52·11½	53	75	62
„ 8..	Heavy overcast	N.W.	50·10	53	59*	60
„ 9..	Light clouds	N.W.	54·12	56	74	64
„ 10..	Clear	E.	54·12	54	76	62
„ 11..	„	N.E.	52·12	54	74	64
„ 12..	„	N.E.	52·11	54	72	60
„ 13..	„	N.E.	50·10	52	72	60
„ 14..	„	E.	49· 9½	52	70	60
„ 15..	„	E.	48· 8½	52	72	62
„ 16.	„	S.	46· 7½	52	72	62
„ 17 .	„	S.	48· 9	52	71	62
„ 18..	Light clouds	S.W.	48· 9	52	72	62
„ 19..	Clear	S.W.	55·13	55	78	68
„ 20..	„	S.W.	58·14½	55	78	68
„ 21..	„	W.	54·12½	56	77	70
„ 22..	„	S.N.W.	60·16	56	72	68
„ 23..	„	N.	58·15	58	68	67
„ 24..	Heavy overcast	E.	50·10	52	56	54
„ 25..	„	E.	38· 3½	36	34	34
„ 26..	Clouded	S.S.E.	46· 7½	48	62	54
„ 27..	„	N.E.	50·10	52	60	60
„ 28..	Overcast	W.	50·10	52	56	56
„ 29..	Clear	W.	52·11	52	66	60
„ 30..	„	W.	52·11	52	68	60
„ 31..	„	W.	41· 5	46	64	54
June 1..	„	N.	48· 9	48	66	56
„ 2..	„	N.W.	55·13	56	70	62
„ 3..	„	S.W.	48· 9	50	68	58
„ 4..	Overcast	S.	50·10	50	50	56
„ 5..	„	S.E.	46· 8	50	53	54
„ 6..	Rain	N.W.	48· 9	50	48	50
„ 7..	Overcast	N.	48· 9	50	52	52
„ 8..	Light clouds	N.	50·10	52	62	58
„ 9..	Rain	N.	48· 9	52	60	58
„ 10..	Clouded	N.E.	48· 9	48	46	48
„ 11..	Clear	N.W.	46· 7½	50	58	52
„ 12..	Clouded	Quiet	44· 6½	46	54	50
„ 13..	Clear	N.W.	44· 6½	46	56	52
„ 14..	„	N.W.	48· 9	50	70	58†
„ 15..	Clouded	N.E.	46· 8	50	58	52
„ 16..	„	N.E.	48· 9	50	62	52

* Wind. † 1 a.m.

The above experiments lead me to the following conclusions:—

1. The Mederer preserving chamber by its special construction, quite apart from the temperature conditions, considerably retards decay by certain germicide properties.

2. The air current inside the chamber is rapid enough to carry off vapours emitted before they have an opportunity to contaminate perishable produce in the chamber.

3. A certain fixed relation exists between the rapidity of the air current in the chamber, the moisture contents of the outer air, and the preservative action of the chamber. If the air current is stopped or the moisture content of the outside air rises to 100 per cent., the special preservative action of the chamber, independent from temperature conditions, is stopped.

4. In order to secure the special germicide action of the chamber it is very important that the construction is perfect and that the amount of moisture used is regulated with extreme care. A faulty construction and an ill-regulated water supply will affect the efficiency of the chamber very materially.

Experiments with the chamber have shown that the temperature inside can be lowered to 32° F.; thus, to the germicide action of the chamber, the preserving effect of a low temperature can be added. This establishes a fundamental difference in principle from the ordinary system of cold storing in an insulated refrigerated building. The refrigerated cold store possesses no germicide properties owing to the special construction; the entire preserving effect is due to the low temperature.

The Mederer chamber preserves partly by low temperature, partly by germ destruction. Even if germ destruction should be stayed for a few days by excessive moisture content of the outer air, then decay inside the chamber will be kept at bay by the low temperature obtaining. The fact that the Mederer chamber allows us to preserve perishables at a higher temperature than the one usually obtaining in cold storage has a decided practical advantage. From my experience in butter storing I can adduce two general rules which will, I think, prove applicable to other perishable produce as well, at least within certain limits—

1. The lower the storage temperature, the severer the check to decay, and the longer butter can be kept.

2. The greater the difference between storage and outside temperature the quicker decay will set in once the butter leaves the cold store.

In this country the difference between storage and outside temperature is often very considerable, and this explains the general complaint "the butter goes off in three days". When the butter is preserved at a higher temperature in the preserving chamber, the difference between storage and outside temperature will be less and the decay will be slower to set in once the butter leaves the chamber. Therefore the user of the chamber should decide beforehand how long he wants to store perishables and regulate the temperature accordingly, not lowering it more than is necessary for preserving the produce during the required period. The longer this period the more the temperature will have to be lowered.

I cannot rest satisfied by merely making the practical observation that the chamber does act, but I want to reason out why it does, even at the risk of my theory being afterwards disproved. It has been

suggested that by the special construction of the chamber small quantities of ozone are formed, and that this ozone should cause the peculiar action of the chamber. Ozone may be formed or not; in any case the quantity formed would be minute, and I doubt whether the minute quantities could produce the special effect. Moreover, I doubt whether ozone would so powerfully affect aerobic bacteria as the chamber seems to do. I have therefore tried to find another solution based on the construction of the chamber.

I find that great care is taken for earth-isolation; the outer air passes under the floor, and the final effect is, so to say, " a chamber in the air, isolated from the ground ". At the same time we have isolation from earth moisture, and as brick is not a good conductor, isolation from earth electricity. The outer wall of the chamber is constructed of absorbent, perforated brick, and this outer wall is kept in a sodden state. Sun and wind have free access to this wall, and the whole building is a kind of filter giving free access to the air. What is bound to happen?

A continuous evaporation of moisture occurs in the outer wall; this produces electricity which tends to accumulate a positive charge in the outer wall. But brick is neither a good conductor nor a good accumulator, consequently these bricks will easily give up their electric charge. The air passes from the outside, through the bricks, to the inside of the chamber. When passing through the outer wall, the air is charged with moisture and this moist air current will absorb the positive electricity forming on the bricks. The chamber has been isolated from the negative earth current, so the atmosphere in the chamber will be charged with positive electricity. The germicide action of the electric current having been demonstrated beyond a doubt, it is not far fetched to assume that an atmosphere charged with positive electricity should show germicide properties. If ozone is formed as well it can only add to the germicide properties of the chamber.

The experiments in Johannesburg may be considered as a second series, the first series being made by Mr. Mederer in Bloemfontein. The Johannesburg experiments confirm the results obtained in Bloemfontein. With every experiment undertaken in Johannesburg Mr. Mederer has predicted the exact result. This gives me the right to accept the Bloemfontein results as evidence and to deduce conclusions from a comparison of results. My first conclusion is that when a chamber is to be erected a distinction should be made in construction according to the special object in view. I think three types of chamber should be evolved.

1. A chamber for cold storing for a lengthy period, to take the place of existing cold stores with refrigerator machinery. For this purpose I would recommend the construction now in use—a building with five walls and four air spaces between the walls. The building may be either round or square. The round type has the advantage of the stronger construction and less building material being required for enclosing a given superficial area.

2. A chamber for farm use could be constructed with four walls and will be sufficient for the practical use on the farm. One wall more or less makes a considerable difference in expense of building; the item is therefore worth considering. Moreover the Bloemfontein experiments are there to show that a four-wall building will be sufficient.

3. A chamber for railway purposes. In the "shed for perishables" at a railway station the goods will remain for a very limited time, a couple of days at the outside. Therefore the high keeping qualities of a cold store or a farm chamber are uncalled for, and a chamber of lighter construction being able to keep the perishables in a good condition for a shorter period should be sufficient.

I would recommend an experiment at some large station with a three-wall chamber, as I expect that three walls will be sufficient for the purpose. To guard against adverse possibilities (say that the air current would not be strong enough for preserving purposes in a three-wall chamber) the construction should be such that a fourth wall can be added at any time in case this should be necessary. This could best be done by making the inside dimensions 20 inches larger than actually required. Should the experiment show that the fourth wall is indispensable, then these 20 inches will afford the space for such a wall.

To the present construction of the chamber should be added wire netting in one of the air spaces in order to keep out vermin. During the Johannesburg experiments it was clear that mice penetrated through the perforated walls or floor.

Plate 1 gives a ground plan and Plate 2 a section through a Mederer chamber for farm use specially designed for maturing cheese. The ripening cheese is deposited on the two circular tiers of shelving and the brine tanks are placed under these tiers. In this way the cheese would be kept after pressing under ideal conditions for producing a first quality product, provided care be taken that the temperature of the chamber is kept as much as possible at 50° F., or a couple of degrees higher.

The same storeroom could be used for butter or other perishable farm produce. On farms where no butter or cheese is made, the chamber could be erected without shelving, and the cans of cream or milk could be kept till the time of dispatch. The farmer possessing such a chamber does not require a separator, for he can place his cans of milk in the chamber for a week or so and then gather the cream by hand skimming. If the chamber is well constructed and well handled the cream will be perfectly sweet even then.

Moreover, as the fish experiment proved, there need be no fear of storing different kinds of perishables, like potatoes, eggs, cream, etc., in one chamber as no contamination will take place.

If the round shape of the chamber presents any difficulties for the construction of the circular brine tanks and the circular shelving, the square or oblong type may be chosen, as shown on Plates 3 and 4.

It is a particular pleasure to me to report on this chamber, as it is a purely South African invention. Hitherto I have always been writing about ideas which originated oversea, but in this instance I am dealing with a subject which is South African to the core, an invention resulting from South African energy and perseverance.

Further, I may say that the adoption of Mr. Mederer's system opens up unlimited possibilities to the production of perishables in South Africa, which production is now seriously hampered by difficulties of transport and preservation. It is proverbially unwise to risk any predictions for the future, but a public utterance of the Earl of Selborne that we are lacking in imagination emboldens me to risk a peep into the future, say, the end of our present century.

South Africa has awakened. The anomalous condition of affairs

that a country eminently suited for the production of perishable produce should import a large portion of such produce required for its own consumption is a thing of the dim past. No more milk fed to the swine for lack of proper facilities of advantageously disposing of the product. The turning of the butter into soap, as a glutted local market brought the prices down to vanishing point, is no longer a reality but an anecdote of the olden days. The country is dotted with preserving chambers; the most important farms have their own chamber; sometimes one chamber serves a cluster of farms. The farmer producing meat, vegetables, fruit, eggs, poultry, and dairy produce has to solve the problem of carrying his produce in good condition to the nearest railway station. There it will at once be placed in the chamber for perishables, and he knows that in the same condition as it reaches the first link of the chain, it will be placed on the world's markets. In every train there is at least one or more cars for perishables, emptying the chambers of their contents at their stations of call. Special trains for perishables are running, all the cars being of the special construction. At the ports huge preservation stores receive the perishable consignments till they can be brought on board the steamers which carry them to the world's greatest market. The system is working enormous economical changes and upheavals, but this would lead me too far. We may not live to see this time; let us be satisfied to lay the foundations for it.

A special word of warning for those who wish to construct a preserving chamber may not be superfluous. The patent is the property of the Mederer Chilling and Preserving Chamber, Limited. The consent for erection must be obtained from this company. The technical instructions for constructing and treating the chamber given by Mr. Mederer should be followed to the very letter. A seemingly slight fault in construction may render the chamber inactive, and a change in the quantity of water used will effect a change in the temperature of the chamber.

Probably the best way of wetting the outer wall will be a closed canvas hose connected with a water tank. The continuous leaking of the hose is sufficient to keep the wall moist. This will secure a regular trickling of water which will be followed by a regular temperature inside the chamber.

A few main points in construction are the following:—

Floor.—First one layer of perforated porous brick on end, the bricks placed apart, not touching each other, allowing free circulation of air. Over this a layer of tiles is laid, then another layer of brick on end and a second layer of tiles. Through this floor the air passes on its way to the well in the centre of the chamber.

Walls.—Six-inch porous, perforated brick, 4-inch air-space between two succeeding walls. The bricks are arranged in such a way that no straight passages are formed; no light can penetrate into the chamber.

Roof.—Double, with air circulation.

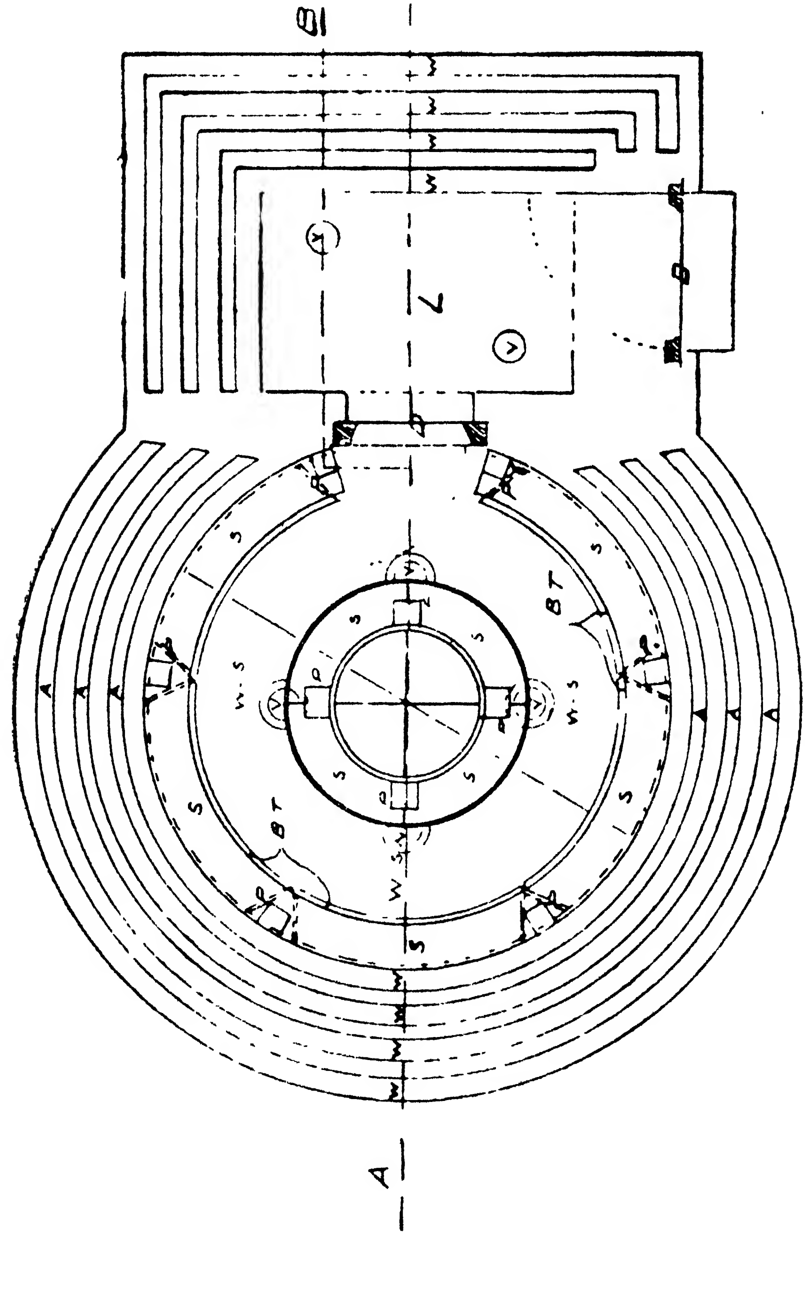


Plate 1.—Plan of Round Chamber.

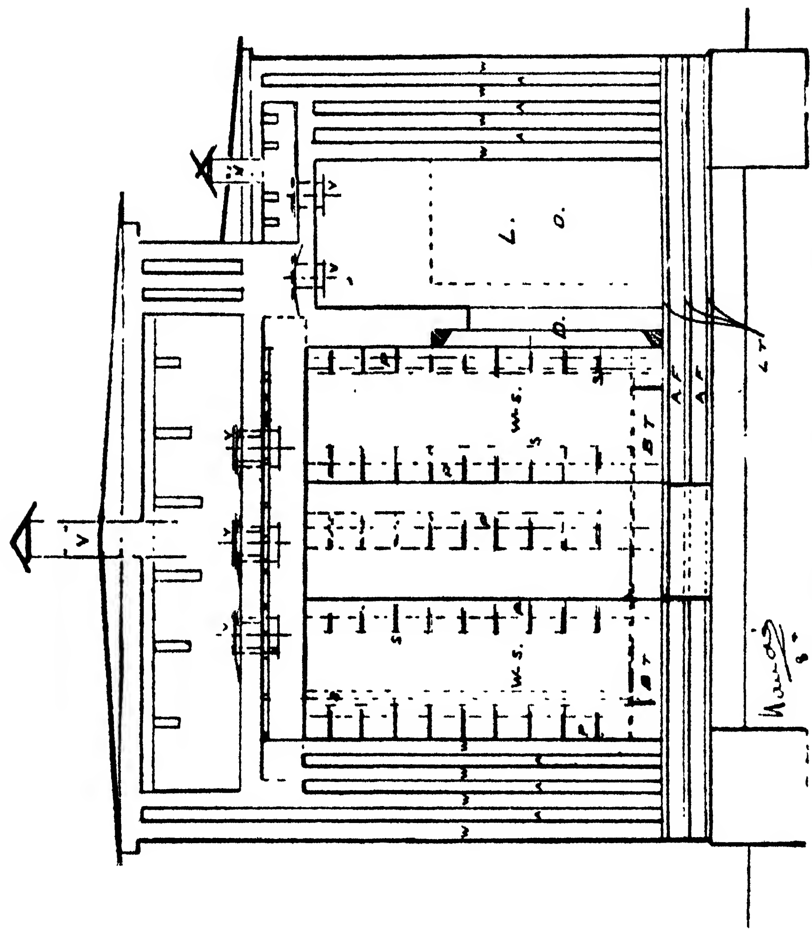


Plate 2.—Section "A" "B" of Round Chamber.

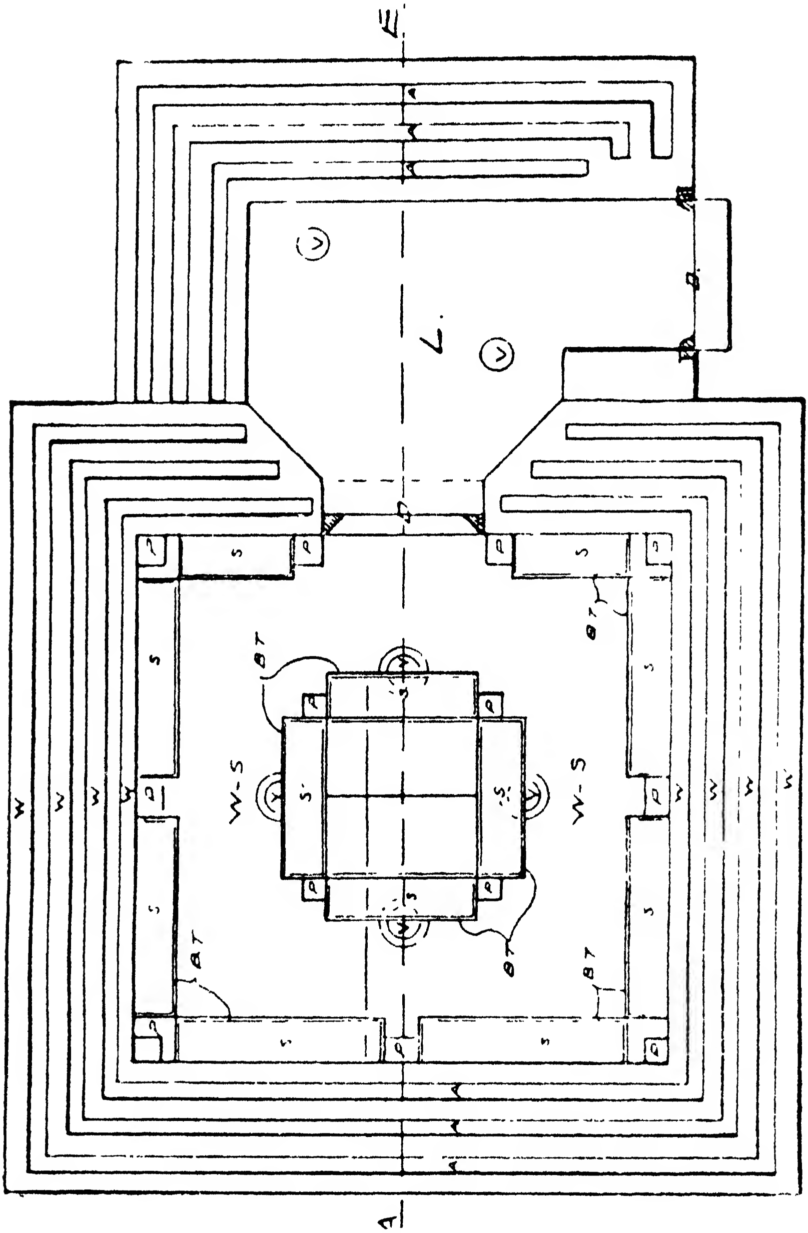


Plate 5.—Plan of Square Chamber.

A.—Three 4-in. air spaces between walls.
A. F.—Two air-brick fl ors.
B. T.—Brine tanks, below tiers of shelving.
D.—Doors to outside and to interior.
L.—Lobby.
L. T.—Layers of tiling between floors.
V.—Ventilators.
W. S.—Working space in chamber.
P.—Posts 6 in. × 6 in. for supporting shelving.
S.—Tiers of 12-in. shelving, spaced 12 in.
W.—Well in middle of chamber.

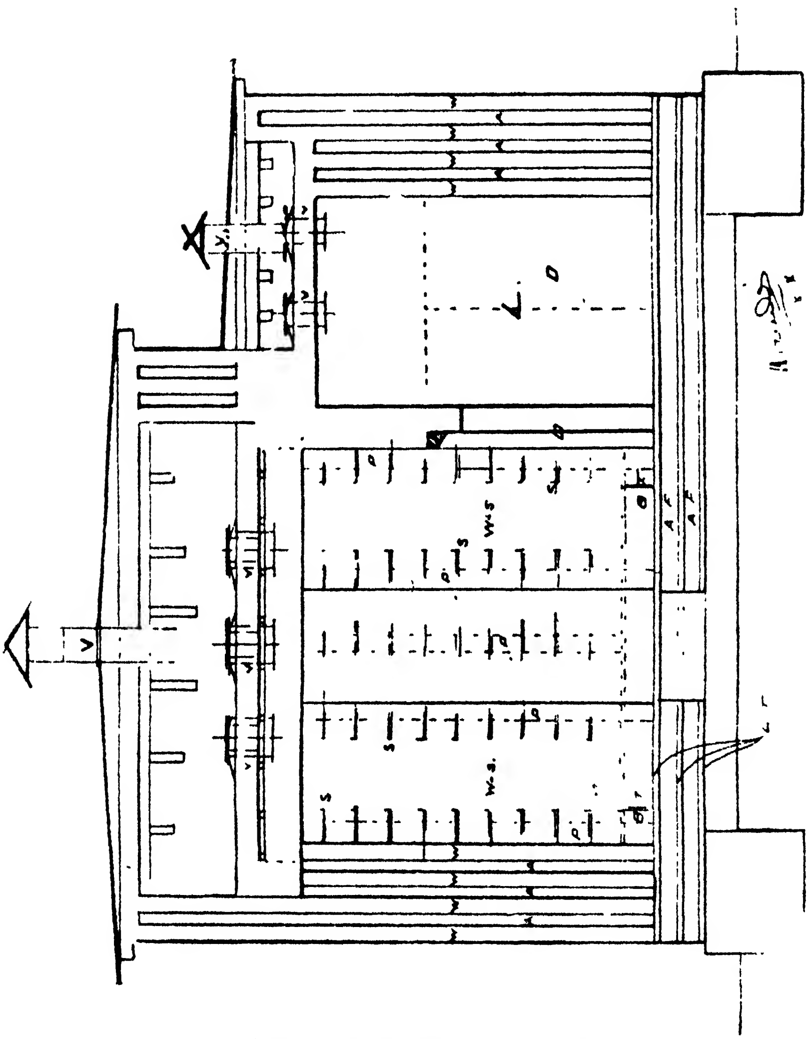
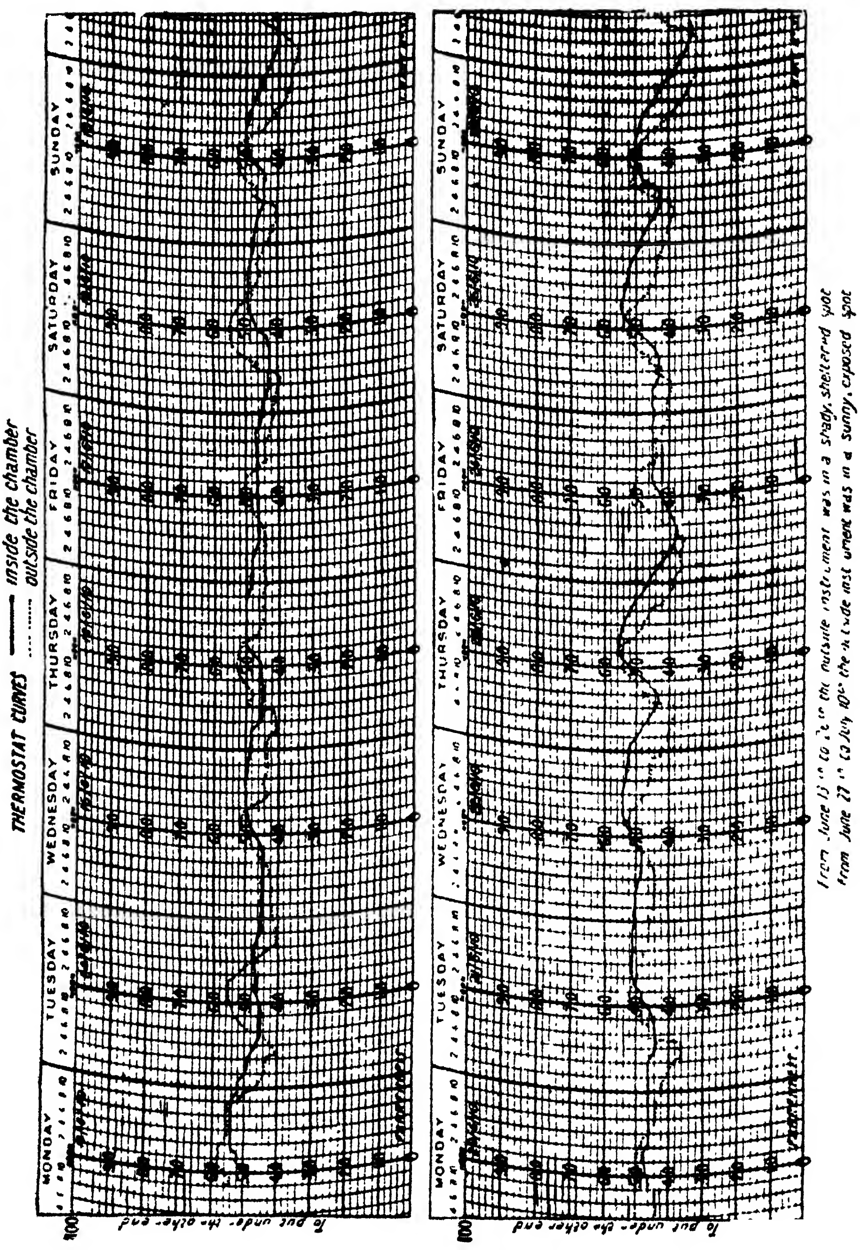
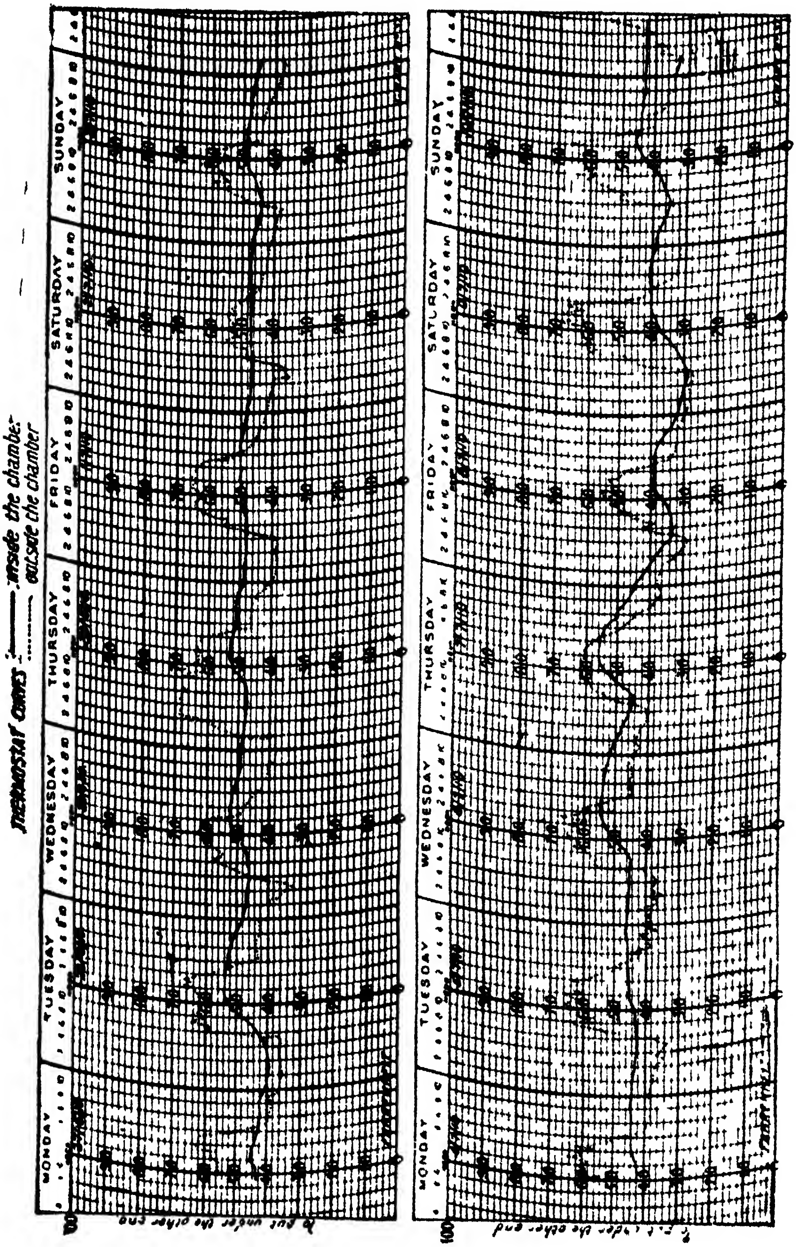


Plate 4.—Section of Square Chamber.

A.—Three 4-in. air spaces between walls.
A. F.—Two air-brick floors.
B. T.—Brine tanks, below tiers of shelving.
D.—Doors to outside and to interior.
L.—Lobby.
L. T.—Layers of tiling between floors.
V.—Ventilators.
W. S.—Working space in chamber.
P.—Posts 6 in. × 6 in. for supporting shelving.
S.—Tiers of 12-in. shelving, spaced 12 in.
W.—Well in middle of chamber.


THERMOSTAT CURVES —— inside the chamber
...... outside the chamber
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
SUNDAY
To put under the other end
To put under the other end



From 13th to 26th June the outside instrument was in a shady, sheltered spot
From 27th June to 10th July the outside instrument was in a sunny, exposed spot.

Plant Poisons.

By Joseph Burtt-Davy, F.L.S., F.R.G.S., etc., Government Botanist (Transvaal).

The losses among stock in South Africa due to poisonous plants have not received that attention which the subject deserves owing to the fact that hitherto efforts have been largely concentrated upon tick-borne and other diseases due to parasites. Now that these parasitic diseases are in a measure under control, stock farmers are turning their attention to other sources of loss among their flocks and herds such as lack of winter feed and direct loss from eating poisonous plants. The recent ravages of "gal-lamziekte" in Bechuanaland and the adjacent districts of the Transvaal and Orange Free State, a disease which appears to be caused by some obscure poisonous plant, have brought the subject prominently before the public.

I do not propose to discuss gal-lamziekte in the present article, as a joint report on the subject by Dr. Theiler and myself is in course of preparation. But in order to secure the intelligent assistance of stock farmers in clearing up the problems connected with poisonous plants, I have prepared the following preliminary notes on plant poisoning. I shall be glad to receive from farmers throughout South Africa, and especially in the gal-lamziekte area, specimens of any of the grasses, bushes, or "weeds" which are eaten by stock, and of any plants which are suspected of being poisonous; these can be sent post free if marked "O.H.M.S.", and addressed—

"The Government Botanist,
P.O. Box 434,
Pretoria."

In discussing gal-lamziekte many farmers have expressed the opinion that the disease is caused by some poisonous plant. Others have thought this improbable, or even impossible, because of certain peculiarities connected with the incidence of the disease. A study of plant poisoning in different parts of the world explains some of these peculiarities, which are quite compatible with the known characteristics of poisoning by certain plants, as can be seen from the following notes:—

Season of the Year.—With some poisonous plants trouble is experienced mainly at certain seasons of the year; this is particularly the case with the tulps (species of *Homeria* and *Moraea*) and slangkop (*Urginea Burkei*) and usually also with Chailletia or Gift-blaar (*Dichapetalum cymosum*). In these cases the reason may be traced to the fact that the plants in question make their new growth of foliage before the rains begin and therefore at a time when green

feed is scarce and stock are suffering from a prolonged diet of dry food. They pick up the poisonous foliage in their eagerness for something green, either in ignorance of its poisonous character or accidentally among the short grass just springing. Such plants are usually avoided by animals accustomed to them. But with other poisonous plants the case is sometimes quite different.

In veterinary practice it is commonly recognized that a plant may be harmful at one time and not at another. It is well known that vegetable drugs differ in potency at different seasons of the year, the difference being, perhaps, correlated with the stage of growth of the plant. Some are only officinal if gathered at a particular season or stage of development. That a similar difference may apply to the toxicity of some plants is shown by Melter (1899), who records that his horse ate 500 lb. of dried hay of *Passiflora incarnata* without any injurious effect; it had been gathered in July when the plant had passed the flowering stage. In the following March, eight months later, the horse ate only 25 lb. of the dried plant, which had been gathered for medicinal purposes when in flower (the condition in which it is most potent); this time the result was fatal.

The Condition and Age of a Plant may affect its Toxic Properties.—The poisonous principle of some plants (e.g. *Conium maculatum*) is volatile, and the dried material may be less dangerous than the fresh. Hay made from the sleepy grass of New Mexico (*Stipa Vaseyi*) does not appear to possess any poisonous qualities, although in the fresh state the plant has a narcotic effect on horses (Scribner, 1898). The young plants of *Lotus arabicus* of northern Africa are highly poisonous to horses, sheep, and goats, according to Dunstan and Henry, but the old, mature plants are freely used as a fodder by the natives. Feeding experiments with *Crotalaria burkeana* produced no effect when the plants were partially dried. This factor renders the investigation of the poisonous principle of some plants more difficult, as they lose a large part of the poison on being gathered or prepared for research.

Some parts of certain plants are more poisonous than others. The fruits of the Hemlock (*Conium maculatum*) and the seeds of Stramonium (*Datura stramonium*), of species of Lathyrus, and of other plants, contain a larger proportion of poison than the foliage.

The relative proportion of poison contained probably differs in individuals of the same species, just as there is a difference in the flavour or sweetness of two fruits from the same tree, in the amount of latex yielded by different rubber-producing trees of the same species, and in the amount and quality of opium produced by the Opium-poppy under varying conditions of soil and climate.

Some kinds of poisonous plants are much more dangerous than others, perhaps because more often eaten, or because the poisonous substance contained is more virulent, or because one kind contains a larger proportion than another. Therefore some species act on the system with great rapidity, while the action of others is relatively slow.

Small doses of some poisons may be taken with beneficial effect, when large doses may be fatal. Some of the most deadly poisons (e.g. Belladonna, Strychnine, Aconite) are valuable drugs when taken in official doses. It is evident, therefore, that a plant is not necessarily harmless because stock are occasionally seen to eat of it without injurious effect.

The toxic properties of plants are not of course due in all cases to the same chemical substance. It is well known that several toxic compounds are present in various plants, which differ in their effect on the animal system, e.g. the Alkaloids, nicotine, morphine, atropine, hyoscyamine, strychnine, and veratine; the Glucosides, lotusine, coronilline, and amygdaline; the Gluco-alkaloid solanine; and the Acids aconitic and hydrocyanic.

Sometimes the same poison is present in more than one species or genus of plants, e.g. hyoscyamine, which is characteristic of the Henbane (*Hyoscyamus niger*) and atropine, characteristic of the Deadly nightshade (*Atropa Belladonna*), these are both present in the Stramonium (*Datura Stramonium*); solanine occurs alike in the Black nightshade (*Solanum nigrum*), the Jerusalem cherry (*Solanum pseudo-capsicum*), the tomato (*Lycopersicum esculentum*), and in the white sprouts and unripe tubers of the potato (*Solanum tuberosum*) when grown near the light.

Similar toxic properties sometimes occur in many plants of the same family.—The presence of poisonous alkaloids, narcotics, acids or acid compounds is often common to and characteristic of many species of a genus and even of a family; thus Hyoscyamus, Atropa, Datura, and Lycopersicum, referred to above, all belong to one plant-family, the Solanaceae. On this account we are able to treat some plant families as more dangerous than others; thus the Ranunculaceae are often acrid and poisonous; the Papaveraceae, the tribe Cichoriaceae of the Compositae, and the Solanaceae are apt to be narcotic; the family Loganiaceae produces some of the most dangerous vegetable drugs known to us. On the other hand, some large families of plants contain no species known to be poisonous, e.g. the Cruciferae, etc.

Not all kinds of animals equally affected.—Some kinds of animals are poisoned by plants which are harmless to other kinds, e.g. Darnel seed is said to be poisonous to man, dogs, horses, and sheep, but to be wholly innocuous to cows, pigs, and ducks (*Wood, Remington,* and *Sadtler*). The well-known Poison ivy, *Rhus toxicodendron,* of the Atlantic coast of North America, and the Poison-oak, *Rhus diversiloba,* of the Pacific coast, are very poisonous to man, but are greedily eaten in quantity by horses with no ill-effect. Morris (1896) states that *Leucaena glauca* is greedily eaten by cattle, sheep, and goats without ill effect, though very injurious to horses, mules, donkeys, and pigs. Dr. Watkins Pitchford suggests that probably all plants which are poisonous to animals are also poisonous to man.

Not all individuals equally susceptible.—Nor are all individuals of the same animal species equally susceptible to certain poisons. In California some people are immune against poisoning by *Rhus diversiloba*; most persons are only slightly inconvenienced, some are made seriously ill, and a few have been killed by it. Chesnut (1898) reports that *Rhus toxicodendron,* of the eastern United States, acts in the same way, and he further states that this variability is not confined to poisons acting externally.

Susceptibility may be increased by ill-health or poverty of condition.—The condition, age, or state of health of the animal sometimes has an influence on its susceptibility to certain poisons, or to the quantity which may be consumed without serious effect. Wilcox (1901) reports that sapotoxin, a poisonous substance found in many plants, is far more injurious when the alimentary tract is ulcerated than when it is healthy.

Acquired craving.—In the case of some poisonous plants animals which taste them develop a morbid craving which, when once acquired, can scarcely be overcome. This is true of *Astragalus Hornii* and other "Loco-weeds" of the western United States. Maiden (1901) reports a similar result from eating the Australian "Indigo Plant" *Swainsona galegifolia*. Chesnut (1898) finds that in the Southern United States stock usually avoid *Helenium autumnale*, but sometimes develop a taste for the plant and are killed quickly by eating it in large quantity. The seeds of the common Boer pumpkin of South Africa, if eaten freely by poultry or ostriches, are said to make the birds "crazy" and to produce temporary paralysis; it is also said that "once they acquire the bad habit of eating the pips it is difficult to break them of it". This craving may be developed to such an extent that animals ignore their proper food and, instead of grazing quietly, spend their time hunting over the camps in search of individuals of the particular plant they have learned to like, even digging up the roots to satisfy their craving, with the result that they become emaciated from lack of sufficient food. This taste is an acquired one, and does not necessarily affect all the animals in a herd or flock. Certain animals on one side of a fence may acquire it, while those on the other side may not. It is well known that animals have their particular friendships and that some of them generally graze together, especially if they belong to the same family. If one member of such a grazing group acquires the taste for a certain poisonous plant it is likely that the other members will learn to eat it also.

These facts might explain the "spread" of a disease caused by poisoning, to farms which were hitherto supposed to be clean. Farmers who have a herd affected with a disease which is not contagious sometimes move to supposed clean farms, either hiring the grazing or selling the herds outright. If some of these animals have acquired the taste for the particular plant they will hunt for it, and if they find it in sufficient quantity will eat of it and become affected; in this way the disease may "spread".

This abnormal craving may be acquired through scarcity of feed in winter or early spring, which causes the animals to eat anything green. If they are moved to a farm where the feed has not been eaten down closely they are likely to find enough of their normal food to make it unnecessary to resort to the dangerous species, and so the losses may be checked for a certain time, only to recommence, however, when the veld is eaten down. In such cases an obvious method of treatment is the provision of an adequate supply of palatable winter feed such as Teff hay. This would act as a preventive, but not as a remedy for cases where the poison has already been taken into the system.

A distaste may also be acquired.—It is commonly stated by men who are much with stock in South Africa that animals learn to know and to avoid poisonous plants. Certain it is that stock brought up on a farm where Tulp abounds will feed among it constantly and with impunity, often without the loss of a single head, while strange animals, from places where it does not grow, will eat of it and die if not carefully watched and treated. Experiments carried out by our Veterinary Division tend to confirm this view; G. V. S. Dunphy (1906) notes that sheep and goats which had once been poisoned with *Dichapetalum* and had recovered from the effects seemed to show a

great dislike for the leaves. In a test with Yellow Tulp (*Homeria pallida*) Doctor Theiler was unable to induce a hungry ox which had been starved for thirty-six hours to eat Tulp even when chopped and well mixed with hay.

Small amounts of poison may sometimes be taken with impunity. It does not necessarily follow that a plant is harmless because stock are occasionally seen to eat of it without injurious effect, for large doses may be fatal. Some deadly poisons (e.g. Strychnine, Belladonna, and Aconite) are valuable drugs when taken in official doses.

Many stock farmers of the Transvaal are firmly convinced that the converse is also true, and are prone to give decoctions of Tulp or Gift-blaar to render their cattle and horses immune.

Classification.—Vegetable poisons may be grouped as follows, if we adopt Kobert's classification of poisonous substances:—

1. Irritants which cause gross anatomical changes of the organs, e.g. croton oil and savin.

2. Blood poisons—
   - (*a*) which interfere with the circulation in a purely physical manner, e.g. ricin and abrin;
   - (*b*) which dissolve the red corpuscles, e.g. the saponins;
   - (*c*) which, with or without primary solution of the red blood corpuscles, produce in the blood met-haemoglobin, e.g. picric acid;
   - (*d*) which have a peculiar action on the colouring matter of the blood or on its decomposition products, e.g. hydric cyanid.

3. Poisons which kill without the production of gross anatomical change—
   - (*a*) which affect the cerebro-spinal system, e.g. strychnine, morphine, coniin, curarine, atropine, strophine, aconitine, etc.;
   - (*b*) which affect the heart, e.g. digitalin, helleborin, muscarin.

(*To be continued.*)

Drying the Smyrna Fig in California.

By R. A. Davis, Government Horticulturist.

Thanks to the action of the Government in providing a grant in aid, the writer was able to pay a visit to California during a recent vacation. Information was obtained with regard to the most up-to-date methods connected with citrus fruit packing and machinery for same, date culture, and the handling of the Smyrna fig, or, as it is called in California, the Calimyrna fig, and it is proposed to give a few notes on the latter fruit first.

The question of the growth of the fruit itself, and the vicissitudes connected with the introduction and establishment of the *Blastophaga grossorum* or fig wasp in California is another matter, and will be dealt with later.

The following remarks are in connection with the actual handling of the crop, either in a green or dried condition. It may be stated at the outset that entomology and horticulture are so intimately bound up in the production of the Smyrna fig that it is as impossible for the horticulturist to write about it without trenching on matters entomological as it would be for the entomologist to touch the subject without dealing with horticulture. It will thus be seen that an excellent opportunity is afforded of co-operative work; in fact, had not such existed in California, it is doubtful whether the dried fig industry would have reached the stage which it has at the present day.

The drying season is usually in full swing from the first week in August, and the writer having previously made inquiries as to the best time to arrive in California in order to observe the whole process, was informed that if he came about the middle of that month there would be an excellent opportunity of making every possible investigation. Accordingly, he put in an appearance at Fresno on the 16th, arriving from Lindsay and Reedly, thriving citrus growing districts in southern California, only to find that owing to the abnormol lateness of the season the actual work of fig drying had not commenced. However, in the two districts named observations had been made in the same direction. There had been an opportunity of seeing several fig orchards, and the following notes were made from those visited. An orchard at Lindsay, consisting of 9 acres of Smyrna figs, had the trees planted at 30 feet apart in rows. The owner himself attended to the whole of the work, with some little outside assistance occasionally.

The trees were irrigated three or four times a year; the last time of watering being at least a month before the drying season commenced, as it has been recognized that later irrigations have a tendency to cause souring or fermenting of the fig in the process of drying. As proof of this it was noticed that at one corner of the

Drying the Smyrna Fig in California.

Drying Calimyrna (Smyrna) Figs, showing Drying Shed of the Fancher Creek Nurseries in the backkround. *By permission of Mr. Roeding*

Drying the Smyrna Fig in California.

Grader for grading Calimyrna (Smyrna) Figs in George C. Roeding's Packing House in Fresno, California.

orchard which abutted on to a citrus grove, one particular tree was considerably larger than the others, owing partly to the proximity of an irrigation furrow in the orange orchard. This tree naturally got more water than the rest, and as the oranges were irrigated without any regard to the fig trees, this particular one came in for water in larger quantities and later in the season than any of the others. The consequence was that the fruit had to be kept separate from the rest at drying time because "it invariably fermented".

It would therefore appear to be a fact that irrigation in excess of the needs of the tree and applied too near the ripening of the crop does have the effect of causing fermentation.

The process of drying adopted by the grower is the simplest possible.

The ripe figs are allowed to drop on the ground and are picked up every other day. They are then in a practically dry condition, but are permitted to remain in the sun a day or two longer; they are then placed in sweat boxes for the purpose of obtaining a uniform consistency and degree of moisture and sold out of hand without packing. This may be accounted for by the fact that the demand for Smyrna figs of Californian origin is large and the supply in the particular vicinity small; in any case, the bulk of the crop was handled in this way and fetched 12½ cents or 6d. per lb. dry. The green, that is, ripe undried article, was sold at 5 cents or 2½d. The figs prepared in this crude way were sampled by the writer and were the best tasted throughout his stay in California.

At Reedly, the orchard of Messrs. Newby & Sons was visited. It was found that the practice as regards irrigation was almost identical with that previously mentioned. Drying, as a rule, commences with them about 15th August, and the last previous irrigation is not later than 10th July. The practice of handling the fruit is somewhat different. The trees are inspected every other day and a slight shake given to each; this causes those fruits approaching ripeness to drop. Every other day they are picked up, together with any others which may have fallen. Care is taken not to include unripe specimens, or any such as might be classed as windfalls, because these are likely to set up fermentation. After drying for a couple of days by being spread out in wooden trays and exposed to the rays of the sun, Messrs. Newby dip the fruit in a weak solution of common soda and water, and stack the trays one on the other in order that the figs may go through the sweating process; when the fruit is of the right consistency it is packed and sold; last year's crop fetched 12½ cents per lb.

The next visit was paid to Mr. Martin Miller, who also lives near Reedly, and has been growing and drying Smyrna figs for the past few years. Here again the same practice was in vogue as far as cultivation and irrigation of the orchard were concerned, but the process of curing and packing was somewhat different. Mr. Miller picks his ripe figs from the ground, and, having done so, dries them for a day or two in the sun; then they are all steamed. This process renders the fruit soft and easy of manipulation by the packers, who are usually young girls, daughters of neighbouring ranchers. The figs are pressed out into the required shape, packed in 1-lb. cardboard packets, and neatly labelled for sale. Packers are paid ¾d. per lb., and at this rate average about 6s. per day.

Fig drying at Fresno is carried on principally by Mr. G. Roeding, who has taken the deepest interest in the prosecution of this industry. His work in connection with it has lasted since 1885 until now, when success has attended his efforts, not only in his own instance, but in having through his indefatigable energy induced many other growers to take the matter up. The aspect of the fig industry in California to-day, mainly through Mr. Roeding's example and courage, has reached such a stage as may well lead one to anticipate that within a few years the output from California will rival that of Turkey in quality, and, it is hoped, in quantity also.

Mr. Roeding has 200 acres of Smyrna figs in bearing, and this number of necessity means that an enormous amount of labour is needed to successfully cope with the output. On the occasion of the writer's visit, green figs were being packed in single layer boxes for shipment to the large cities of the Eastern States of America. Since the appearance of this fig on the market, no others sell as well, the flavour is unexcelled. Higher prices are realized than for any other variety just as in the case of the dried article.

The treatment of the fig orchard here is not quite the same as previously mentioned. Cultivation of the soil is resorted to more frequently as a means of conserving moisture, and it is a rare occurrence for the orchard to receive more than one irrigation per annum. Harvesting of the crop is on a far larger scale than in any of the previous cases and special machinery is provided to deal with it (see illustrations).

The method of curing is also different from either of those previously mentioned, and consists of both dipping and steaming. The dip is made of salt, 3 oz. to each gallon of boiling water, and soda at the rate of 1 lb. to each 15 gallons, and for convenience is prepared in a large boiler into which the figs are dipped in a wire basket, lifted up and down two or three times in order that the mixture may reach those in the centre and also to wash off any dirt, etc., which may have adhered whilst the fruit was lying on the ground. After this, they are laid out on trays for drying in the sun. This is usually completed in a couple of days. The right stage of dryness is determined by pressing the fruit between the fingers; if it feels tough and leathery the right condition has been arrived at and it is ready for sorting for size and quality. Any specimens which are extra large may have to undergo another day's exposure to the sun, and these are laid aside for that purpose. Afterwards the whole lot are placed in boxes or in heaps on the floor of a large room for "sweating". Mr. Roeding has sound ideas on cleanliness, so after the sweating is over the fruit is again washed in salt water, dried as before for another day, and then hauled away to the packing home.

Sizing now takes place and is done by a machine such as is shown in the accompanying illustration. Next comes steaming; this takes place in a chest specially made for the purpose, and after this process is over the fruit is ready for packing.

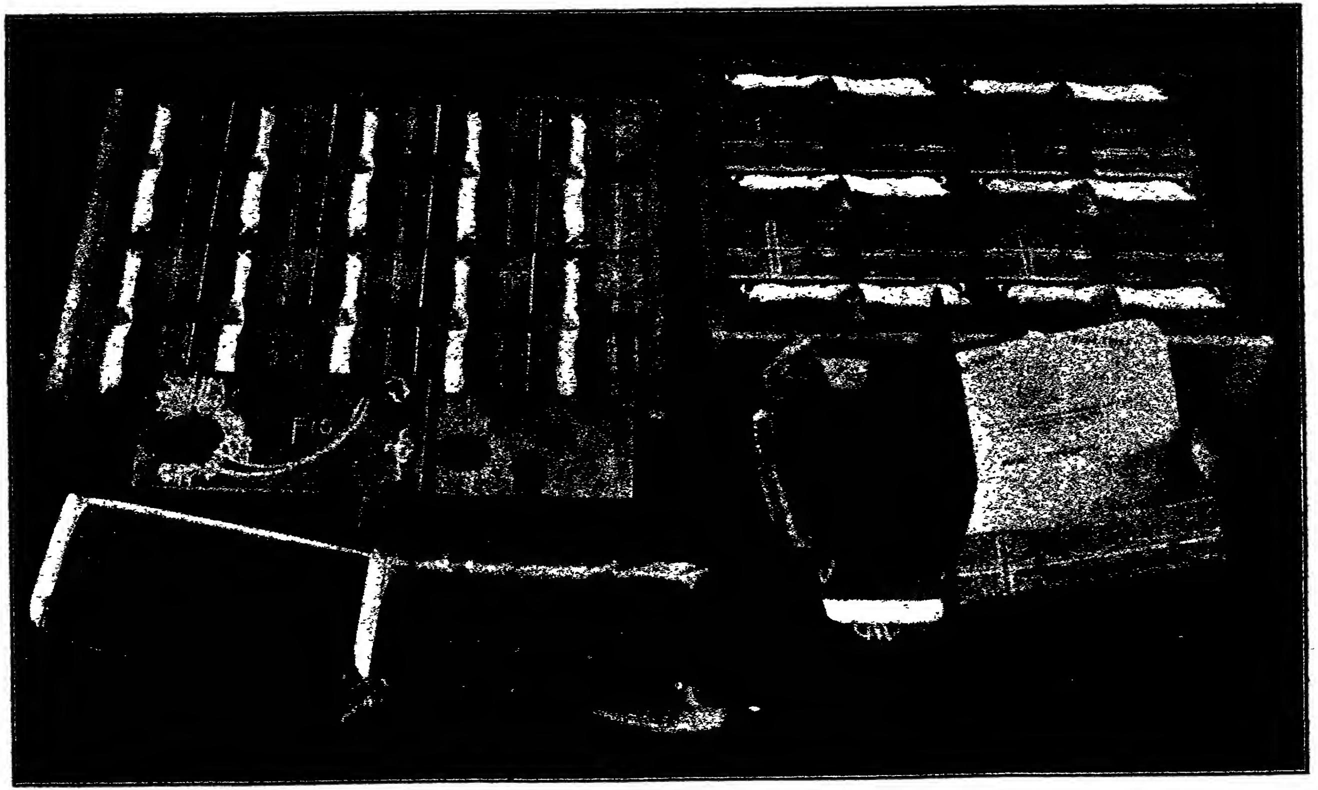
Steaming has the effect of destroying any possible insect life and renders the fruit soft for handling.

The "pack" of figs depends on the size of the fruit. The finest and best are packed in 1 lb. cardboard cartons, smaller sizes are packed in the familiar flat wooden box, whilst the smallest of all are put into large boxes of about 50 lb.

Drying the Smyrna Fig in California.

Forms used in Packing Calimyrna (Smyrna) Figs in the Packing House of George C. Roeding, Fresno, California.

Drying the Smyrna Fig in California.



How Calimyrna (Smyrna) Figs are packed : the finished product.

Packing is done by young women entirely and good wages are earned by a quick worker; of course, the packed fig has quite a different aspect from that which it held on the tree. This is arrived at by pulling it into shape and flattening it out by hand. As this is done the figs are placed in wooden moulds of the exact size of the box in which they are eventually distributed and pressed flat; they are then taken out, wrapped in clean white wax paper, and placed in the cartons.

It will perhaps have been noticed that in each of the four instances mentioned the practice of curing has been different. One man neither dips nor steams his fruit, another dips, a third steams, whilst Mr. Roeding both dips and steams.

As previously stated the untreated fruit grown at Lindsay was the best flavoured of any tasted by the writer whilst in California, and it is strictly in keeping with the Turkish method of drying that this should be so.

No claim up to the present has been advanced in California that their dried product excels or even equals that of Smyrna, and the opinion is openly held by Mr. Swingle and Professor Mason, of the Agricultural Department, in Washington, that the Asiatic article is the best. The following description of Smyrna methods shows the difference in handling:—

TURKISH METHOD OF FIG DRYING.

"The fruit should be in all cases ripe. They should be carefully picked from the tree, and not torn off; cutting is perhaps the best way as the skin is less liable to be bruised.

"Dip the fruit in boiling salt and water, salt 1½ lb. to 50 gallons, for a second or two, and repeat this twice; this softens the skins.

"For sun drying they should be spread on trays (wooden box covers will do) as soon as dipped and exposed to the sun; lay the figs with the stem all in one direction; it is better to keep them off the ground; they are easier to handle.

"They require turning once a day; this is tedious but necessary. Any fermented or "soured" fruit may be thrown away, and it is easily detected when turning. They require covering during damp and wet, and should only be exposed when the sun is shining.

"Average time required about sixteen days, but as some are larger than others they must be examined daily, and those sufficiently dried may be removed. Underdried figs do not keep.

"In order to get one uniform quality it is customary to place the dried figs in boxes for a few days and let them sweat; this equalizes the moisture contents.

"Figs may also be dried in an evaporating machine; this is a more rapid process, but only resorted to where sun drying is not possible, and, as such places are usually more or less damp, the quality of the fig is not as good, consequently the evaporated article cannot compare with that dried in the sun."

The Smyrna fig is the best drier. Some other kinds are dried, but they do not make a first-class article. A comparison shows that in the matter of gathering the fruit the Californian method would be best, as none but ripe fruit falls to the ground, whilst picking from the tree leaves an opening for the inclusion of unripe specimens which do not dry properly. The practice of turning is adopted in

California, but rendered quite simple by the manner in which it is done. The fruit is spread on small wooden trays, 2 by 3 feet in size, these are laid in long rows. To turn the figs an empty tray is secured and placed over the full one at one end of the row. A man on either side of the row takes the two trays together and turns them over, thus exposing to the sun that side of the fruit which was previously underneath, and this goes on all along the row and can be done quickly and effectually. Here again the Californian method is simpler and better.

The time required for drying varies to a great extent; climatic conditions in California account for this. The centre of the fig industry is Fresno, a city in southern California, with a summer climate of great heat, the mercury often rising to 125° in the shade; the atmosphere is dry in the extreme, thus the conditions for rapid work are most favourable. It is, however, an open question as to whether rapid drying always makes the best fruit. It is just possible that the slightly moister atmosphere and lesser solar heat experienced in Smyrna may tend to the production of a better article in the way of dried figs. One thing is certain, no effort will be spared by Californian growers to turn out an article equal to the Smyrna product. The work being done there at present may be regarded more or less as experimental, and may be compared with what occurred thirty years ago when the prune industry of California was in a similar position. In those days there were no prunes like French prunes, and the Californian growers were not able to turn out an article as good as the French in appearance. Persistent effort has, however, been rewarded, and to-day the Californian prune ranks equal to any. It would be surprising if in the course of a few years their dried figs did not make a corresponding improvement.

At this period of the history of South Africa when horticultural and agricultural efforts appear to be endowed with new life and a more general and greater interest is shown in matters connected with the land than at any previous epoch, it is to be expected that, in such districts as may be favourable for growing and curing the Smyrna fig, endeavours will be made to create an industry such as exists in Turkey and to a lesser extent in California. Thanks to the late Agricultural Department of the Cape Colony, the facilities are at hand for the successful growing of the fruit. The male or Capri fig is established both at the Cape and in the Transvaal, the blastophaga or fig wasp has been introducted and acclimatized. The true Smyrna fig of commerce is obtainable. It remains to be seen to what extent farmers will take advantage of the opportunites of securing these necessities to fig culture which through the Agricultural Department the Government has provided for them.

(NOTE.—Since writing the above it has been pointed out that the foregoing article is in the position of the cart before the horse in that some attempt has been made to describe the drying process before the growing of the figs. In reply it may be said the object in placing this part of the subject first was to afford immediate information which might possibly be of some use in dealing with the present crop.)

The Narra Fruit.

A BOTANICAL WONDER IN THE DESERT OF SOUTH AFRICA.

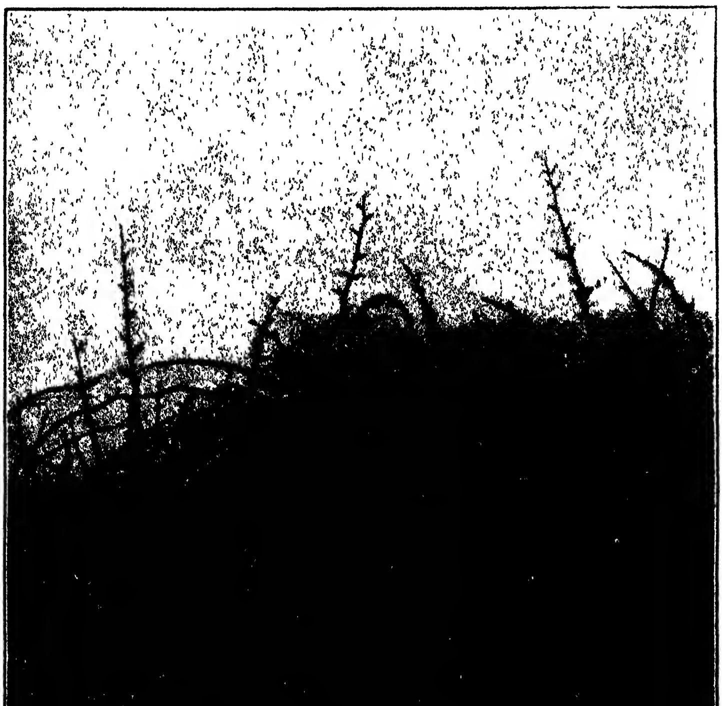
By H. von Gerard, Resident Magistrate, Walfish Bay.

The British territory of Walfish Bay, on the west coast of South Africa, forms part of the Union of South Africa. It is doubtless the poorest and most desolate portion of the Union, consisting of nothing but shifting sand-dunes. At the settlement on the bayside and throughout the territory (with one insignificant exception) no vegetation of any kind exists, nor can exist. The daily south-western hurricane kills or covers everything with sand and the salty sea-air does the rest.

There is no drinking water in the whole district; a few water holes may be found here and there, yielding a brackish nauseating fluid, but even these give out frequently. At the bay settlement a Government condensing station supplies the necessary drinking water. The district is about twenty-seven miles by forty and has only a few white inhabitants at the bay. The native population, mostly Hottentots, number about 800, and are the poorest people in the Union. Their habitats in the desert consist of a few sticks put into the sandhills and covered over with old sacks. The poorest hovels of the Natal coolies are palaces in comparison. The Hottentots are being steadily decimated by tuberculosis. A few are engaged at the Government works at the bay, others go to the neighbouring German town, Swakopmund, the rest live on fish caught in the bay and on the Narrah fruit.

The Narrah or Narra is one of the most interesting products of nature. For the inhabitants of the territory of Walfish Bay it is of the utmost importance, being practically their only food. A failure of the narra season would inevitably mean death from starvation for hundreds. The plant—if such it can be called—belongs to the species of cucurbitacaea or pumpkins, but unlike all pumpkins or melons it is leafless. The leaves are crippled in their first formation and from their centres shoot out, always in pairs, long and very sharp thorns. And this is the very protection needed against animals devouring the fruit. A kind Providence seems to have given the plant specially to the poor inhabitants of the desert, and thus protected and preserved it for them only. The root is not unlike a bramble-bush root and goes 40, 50, and 60 feet down through the sand-dunes until it strikes moist ground. A further protection was needed against the terrible sandstorms raging almost daily and forming immense chains of sand-dunes. For that purpose the plant was given a marvellous power of growth. No matter how often the stem may be covered

The Narrah Fruit.



with sand, its growth always outstrips the sand and the stem remains "top-dog" and pierces through. If it had leaves, like the pumpkin or melon, the sand would weigh them down and with them the stem, which would then be irretrievably lost and perish. Nature is performing thus one of its wonders in preserving the stem leafless, and with it the only means of yielding the only food for the wretched dwellers in the desert.

The fruit is forming in October, reaching maturity about Christmas time and lasting to the end of March. During the reaping season the natives working away from home in German South-West Africa return to their narra fields, nothing will induce them to stay away. The fruit is the size of a small watermelon, containing numerous pits. These are known and sold in Capetown as butterpits. When the husk is removed a very tasty kernel or nut is found full of oil and most nutritious. I have endeavoured to find out whether the plant has ever been raised from seed, but no one in my district has ever done it as there are plenty of roots or stocks available. The German Government some time ago ordered some seed for their own desert dwellers, but I have heard of no result. The seed is mostly boiled with the flesh of the fruit, and such seed, of course, is useless for germination. I am informed it was boiled seed the German Government obtained. Most seed brought into the bay settlement to the storekeepers is so boiled. For experimental purposes one must get the raw fruit itself to ensure getting the right seed.

In order to avoid being accused of plagiarism I wish to state that the chemical properties of the fruit and seed, as given by me in this paper, have been investigated by Dr. Grimme, of the Botanical Institute of Hamburg, who published a short article in the Swakopmund newspaper now lying before me. For all chemical or analytical information I am indebted to that report; the rest of this article is based on my own observations.

I have stated above that the pits taste like very fine nuts. The chief value, however, of the narra is the flesh. When unripe it is atrociously bitter; this disappears entirely when ripe and the flesh becomes cream-coloured, acid-sweet, and almost liquid. It can be divided into quarters like an orange. On account of the saccharine or sugar it contains it is extraordinarily nutritious. It is the staple food of the Hottentots in my district, and as it can really last the whole year through in a preserved state—as will be shown later on—the Hottentots stay mostly at home. They are on principle opposed to work, and never work unless driven to it by hunger. I doubt whether one-tenth of the native population in this territory ever go out to work.

I am myself experimenting whether I can get unboiled seed to grow and fructify. If the experiment is successful, it will prove the possibility of quite a large and lucrative trade being established at this port. The excellent oil that can be extracted from the nuts, the albumen from the flesh, and the alcohol from the rich sugar containing liquid are properties of a highly marketable value. There would be no labour required for ploughing, harrowing, weeding, or hoeing and the yield of nuts alone would be enormous.

The narra country extends from Walfish Bay eastwards right through the desert for many miles, but the principal yield is in the British territory. The natives search the stocks of the narra bushes

all round that settlement and leave the German hinterland alone on account of the lack of drinking water. In the small villages, Sandfontein and Rooibank, belonging to the Walfish Bay territory, the householders have small narra plots marked off which are handed down from sire to son. Those who do not possess any such plots travel in the narra season with wife and child from sand-dune to sand-dune, striking with sticks at the bushes to test the fruits as to their ripeness. The daily food required is consumed on the spot for simplicity sake. If the maturing proceeds so rapidly that the narra-melons cannot be all consumed at once, they are boiled in a pot to a thick pap, and, while still liquid, sieved through a crudely woven basket in order to separate the valuable pits. The pap itself is poured out on to the sand and dried by the sun into huge pancakes. The pits are sold by the improvident ones to the storekeepers, who send them to Capetown where they are readily bought as nuts, and even used as almonds for confectionery. The pancakes formed as above described are rolled up, sand and all, and stored up as winter provisions for the "hunger months". They are consumed either without any preparation, slices being cut off like from rolled tobacco, or boiled, producing then a very nutritious thick soup. The flesh is also used in another way. The fruit when ripe is laid in the sun for two or three days to further the development of the juice or sap. They are then pressed and the sap boiled up into syrup. This syrup is extremely sweet and is largely used to make beer. To help on fermentation portions of the narra root are scraped into the liquid. The root is exceedingly bitter and is used by the natives as medicine. They maintain that the odour of the narra-melon alone is sufficient to congeal milk placed in the vicinity; so much is certain that the juice of the fruit put into milk congeals it at once. The unripe fruit, however, has no such effect, so that in the ripe fruit some kind of acid must be contained.

When first tasted by a European the dried flesh or pancakes cause the palate and gum to swell and burn, but no ill-effects or injuries result therefrom. The bay Hottentot, who from childhood is forced to live on narra, does not, of course, notice anything of this kind. The pancakes are of a thick consistency and to tear them requires the teeth of a Hottentot. When boiled a sediment forms consisting of starch; the dark-brown soup contains the sugar and pectine. The narra pits are pressed between stones and a delicious oil is thus won, but only from the raw pits; the boiled pits lose the oil to a great extent. The shell or husk is very hard; when opened it breaks into two halves. Even when the oil is extracted the pits are splendid food for poultry on account of the large percentage of albumen, and would give a valuable preparation for an artificial food for invalids and infants.

I have styled the narra a botanical wonder. No other vegetation exists in the desert at and around Walfish Bay; no other food for the natives except fish in the bay. There are no cattle of any kind. To enable the narra root to withstand the terrific sandstorms the Almighty has given it a marvellous power of growing through the sand-dunes, and to protect it against animals feeding on the fruit the root is armed with numerous long sharp thorns. Thus the food is preserved for the wretched desert-dwellers.

It is a marvellous fruit. Its nutritive powers are equally so. I state on the authority of the Rev. Schaible, the local missionary, that

natives returning from work on the verge of death from starvation after a few months at home in the narra season are cured and become fat and sleek. The bushes are covered with enormous quantities of fruits, and there are between sixty and seventy pits in each. An industrial development would be an easy matter if the natives would adopt regular work and if systematic farming were introduced. The plant is very frugal and really only needs a little water to grow right in the sand-dunes. Where water is obtainable, were it only brackish, or groundwater, the plant easily lives and the yield is generous in the extreme.

South Africa's Fresh Fruit Export Trade.

ANNUAL REPORT OF THE TRADES COMMISSIONER IN LONDON FOR 1911.

MY annual report on the fresh fruit export trade for 1911 will now cover, for the first time, fruit shipped from all ports of the Union. I do not include citrus fruit, as this subject will be dealt with in a separate report.

I was very glad to notice small trial shipments of plums from Natal, apples from the Orange Free State, mangoes from the Barberton District, as well as excellent grapes and a few experimental shipments of apples from the midland districts of the Cape Province.

The following figures show the total number of boxes of fruit exported *during the seven years up to* 1905:—

1899	10,817
1900	17,336
1901	17,265
1902	14,998
1903	21,968
1904	34,723
1905	23,832

The undermentioned figures (up to and including 1910) show the quantities of each class of fruit exported from the Cape Province for the past five years. The figures for 1911 include the total shipments of fruit from all Union ports:—

	1906.	1907.	1908.	1909.	1910.	1911.
Peaches	7,612	10,572	12,925	17,298	23,646	27,800
Pears	19,025	22,213	51,614	55,129	98,704	62,067
Plums	15,583	23,160	15,047	32,184	25,025	47,560
Nectarines	1,151	1,149	762	2,191	2,581	3,863
Grapes	15,491	23,291	77,367	32,323	46,806	86,030
Melons	—	—	1,494	216	750	1,134
Apricots	868	1,214	10,486	2,164	3,383	8,121
Apples	41	213	450	201	90	118
Pines	70	494	2,440	32,095	835	8,173
Mangoes	—	—	—	—	—	513
Sundries	25	49	153	121	51	170
TOTALS	59,866	82,355	172,922	173,922	201,871	245,549

Distribution and Markets.—South African fruit is now becoming more generally known throughout the markets of the British Isles and the chief centres on the Continent of Europe. These markets are being steadily developed. It has generally been thought by persons who have not made a careful study of the requirements of those markets that they can take large quantities of fruit straight away. This is an erroneous idea; there were a great many obstacles to overcome and

problems to be solved, such as cheap and efficient means of transport, etc. These, to a great extent, have now been overcome by the rearrangement of the classification of South African fruits in the English railway tariffs and the arrangement of more expeditious routes for the Continent in conjunction with the arrival of the steamers carrying South African fruit, and the quick dispatch of the fruit from Southampton to Hamburg via Grimsby, these facilities having been arranged on representations from this Department.

The condition of the fruit on arrival on the Continental markets is now much improved, and the prices are consequently better, while the demand is steadily increasing. Shippers can rest assured that everything is being done to develop these markets; their agents here are well acquainted with the requirements and take full advantage of those markets for the sale of fruit entrusted to their charge.

I would recommend shippers not to consign fruit direct to Continental markets without advising their London agent. I think shippers would do well to leave matters concerning the redistribution of fruit to both Continental and American markets to their representatives here.

Consignees of South African fruit who have made arrangements for the transhipment of portions of their consignments to the Continent have complained that they cannot get such lots out in time for the special train leaving Southampton for Grimsby at 9.5 a.m. As the ship starts discharging the fruit at 5 a.m. and does not finish a large shipment until about noon, it will be obvious that unless shippers arrange to have a certain portion of their fruit stowed in the cool chamber, which could be opened first, and advise their agents accordingly, it is doubtful whether the consignments for Hamburg can be got out in time for the Grimsby train. As the advantage taken of this train has proved of great benefit to the South African fruit trade, I would urge shippers to facilitate matters by carrying out this arrangement.

It must be further pointed out that the White Star liner for New York leaves Southampton Docks at 12 noon, and that agents are anxious to take advantage of her for the shipment of their American consignments.

PACKING, GRADING, VARIETIES, TRANSPORTATION, COSTS, ETC.

I have dealt fully in my previous annual reports with the questions of packing and grading, the most suitable varieties to grow for these markets, and with matters of refrigeration and transportation, and costs of shipping the different varieties of fruit. As most of these matters are now being better understood and considerable improvements have been effected, I do not feel justified in repeating my remarks in this report. But should new shippers desire this information, they should write to the Agricultural Department for my Annual Fruit Reports of 1909 and 1910.

Points to Observe.—I cannot, however, refrain from reminding growers and shippers of the important points necessary to firmly establish this trade on a sound and profitable basis, which will command the respect and patronage of dealers and consumers alike:—

(1) Continue to acquire knowledge in connection with this trade.
(2) Send only your best fruit to this market.

(3) Give your personal attention to the grading, packing, and transportation.
(4) Study the wants of the markets as to varieties and qualities, and send only what the markets require.
(5) Study your farm, the habits of your trees, and the keeping qualities of the fruit from the different parts of your land grown under different conditions.
(6) Aim at the further development of the trade in the large commercial classes of fruits, such as apples, pears, oranges, Almeria grapes, and also pines.

In regard to the pears, in so far as quality and condition on arrival is concerned, we are already well ahead of any other country shipping this particular fruit to this market, and there is no reason why we should not do likewise with the other fruits mentioned. All these fruits can be grown, and we must learn what varieties the markets want and how to ship them.

London Firms' Agents in South Africa.—With reference to the methods in vogue here for the selling and distribution of the fruit for account of shippers I must say that there are still some unsatisfactory features; these are, however, matters which cannot be discussed in a public report.

I am constantly in consultation here with the agents of shippers, and in most cases they are willing to co-operate with me to adopt such methods as will be more advantageous to shippers.

I feel it my duty to call attention to a rather new element which has arisen in connection with the collection and shipment of fruit from the Union. Some commission agents, auctioneers, and salesmen on this side, in their desire to increase their business, have appointed agents or canvassers in South Africa to procure consignments for them, and in some cases at considerable cost. This has compelled other agents who had established connections before the competition was so keen to also appoint agents in South Africa. It is to be regretted that this should have taken place, as it constitutes a new burden of expenditure which will indirectly have to be borne by the shippers.

I would recommend the Government to offer such facilities at the railway stations and at the ports for the shipping of fruit direct to these markets, either through the shippers or their established shipping agents, so as to do away with the necessity for the cost of maintaining the intermediate man representing London commission agents, auctioneers, and salesmen.

Apricots.—During the past season 8121 boxes of apricots were received, as against 3383 the previous season.

The fruit arrived, generally, in a very good condition, and there was considerable improvement in the system of packing, some of the shippers having adopted new and attractive methods. One shipper was very successful in putting up his fruit in small trays, each containing twenty fair-sized apricots. These were packed in crates, each containing twenty trays.

The prices throughout the season were quite satisfactory, and for good large fruit excellent prices were obtained.

The first shipment arrived on the 10th December. This, however, consisted of very small apricots. The following shipment included a small proportion of very good fruit, trays of 48's making up to 8s.

The shipment which arrived on the 31st December realized from 4s. to 6s. according to the quality and size of the fruit.

During January the prices fell slightly.

The last shipment arrived on the 4th February, realizing for first-class fruit from 6s. to 10s. per box; smaller fruit in counts of 63's to 70's making from 3s. to 4s. for the same size box—a big difference which senders should note. Apricots for this market must be large, of a good colour, and of attractive appearance. Small and unattractive fruit of this description can only be sold for cooking purposes, and does not as a rule make more than about 4d. per lb.

Peaches.—During the past season 27,800 boxes of peaches were shipped, as against 23,646 boxes the previous season. This is a reasonable increase, and I do not think that the additional quantity affected he prices much, excepting when the very large shipment arrived in the middle of February.

The bulk of the fruit arrived in a sound condition. There were a few shippers, however, who showed no knowledge of packing and no idea of the type of fruit required for this market, and they must have suffered loss on their shipments in consequence. Though the peaches, as a whole, arrived in a good condition, there were frequent complaints that they were lacking in flavour, and that the flesh of the fruit was dry or not sufficiently juicy.

The transportation of peaches over long distances is a problem of much difficulty. Besides being a very delicate fruit it ripens more quickly than any other fruit shipped from South Africa. The question of placing Cape peaches on the London market in an entirely satisfactory condition must be carefully studied, and a series of experiments in the cold storage should be carried out to ascertain the most suitable temperature in which to convey the fruit and the exact condition of ripeness in which the fruit requires to be picked.

The present temperature adopted by the shipping company in the transportation of South African peaches is from 36° to 38°. Although a great many shippers do not agree with me, I still maintain that peaches will arrive here in a more satisfactory condition if carried in a temperature of 32° to 34°. This will enable the shipper to pick his fruit in a riper condition, and thus allow the sugar to develop in the fruit to a greater degree, whilst the lower temperature will retard the process of ripening more effectively.

The first shipment of peaches arrived on the 24th December. These were very small and of inferior quality, and should not have been shipped.

The following shipment was very much better, and realized from 20s. to 30s. a box for good sound fruit.

During January the shipments were of moderate dimensions, sound fruit with good colour, in counts of 24's to 30's, making from 6s. to 15s. per box.

During February heavy shipments came forward, in some instances over 6000 boxes in one shipment. This naturally adversely affected prices, good sound fruit making from 4s. to 7s. 6d. and yellow peaches from 3s. 3d. to 5s. a box.

I must again warn shippers that it is highly necessary to mark on the end of their boxes the word "freestone" or "clingstone", as the case may be, as well as the variety and the count. The names given to peaches in South Africa are not well known to the buyers

here, and unless the latter know whether it is a "clingstone" or "freestone" peach they will probably offer a price as for the former. It is again necessary for me to warn growers not to ship the yellow nor "clingstone" varieties.

The peach required on these markets must be round in shape, a large size, with a good rich colour, white flesh and freestone.

Nectarines.—3863 boxes of nectarines were shipped during the past season, as compared with 2581 the previous season. This fruit almost always arrives in a good condition and meets with a ready sale at satisfactory prices.

The first shipment of nectarines arrived on the 21st January and the last shipment on the 18th March.

I consider there is more room on the market for nectarines, and I trust that the quantities will be increased in the future.

The prices realized throughout the season for good sound fruit averaged from 8s. to 15s. per single layer trays of various counts, and in a few instances 20s. per tray was realized.

Plums.—There was a considerable increase this year in the quantity of plums coming on to the market, namely, about 47,560 boxes, as against 25,025 boxes last season.

The first shipment arrived from Natal on the 31st December. These were called Methley plums. They were rather small and arrived in a fairly good condition. The packing was inferior, but the fruit had a pleasing flavour. A further shipment of this variety of plum arrived by the following mail. These realized 2s. to 3s. a box. If possible this variety should be shipped to arrive before Christmas.

The first shipment of Cape plums arrived on the 21st January. These were Burbanks and Wicksons. The former made from 3s. 6d. to 5s. a box, and the latter 8s. to 10s.

I kept a careful record of the prices of each variety of plum during each week throughout the past season, and on averaging them I find the following interesting result, which will show the types of plum most appreciated on these markets, viz.:—

	Per Box. s.	d.
Apple	9	6
Kelsey	5	3
Satsuma	5	0
Wickson	4	6
Chalcot...	4	3

There were other varieties of plums which were shipped at different times, but these did not realize satisfactory prices.

I am pleased to report that the quantities of Burbanks shipped have been much reduced, and I would ask shippers not to send this variety if possible, as it gluts the market with a plum which only realizes poor prices and adversely affects the prospects of the better varieties.

The continued improvement in the packing of plums is a noteworthy feature, and, generally speaking, all the shipments arrived in a good condition.

One shipper introduced a new system of packing for Burbanks, namely, in small baskets placed in crates similar to the package recommended by me for grapes. The crate in question measured

9½ by 16½ by 27 and contained eight baskets. No packing or wrapping material was used, and the plums arrived in a very satisfactory condition. The crates realized about £2 each. I estimated at the time that the shipper was saving about 50 per cent. space on a given quantity over that of plums packed in boxes. This system of packing is, however, only suitable for the cheaper variety of plums such as Burbanks.

Pears.—During 1911, 62,067 boxes of pears were exported from South Africa, as against 98,704 during 1910. This is a very serious reduction, and I am informed it was due to severe winds which prevailed previous to the packing season.

The first shipment of pears consisted of Clapp's Favourites. These arrived on the 14th January. They were very green, immature specimens, and realized only 2s. to 4s. a box.

The following shipment was considerably better, and included William Bon Chretiens. The prices made were, for Clapp's Favourites, 5s. to 7s. per box, and for William Bon Chretiens 8s. per box.

During the month of February shipments consisted almost entirely of Clapp's Favourites and William Bon Chretiens. The prices during this month ranged from 3s. 6d. to 5s. 6d. for Clapp's Favourites, and from about 4s. to 8s. 6d. for William Bon Chretiens.

The prices during March for different varieties of pears ranged from 4s. 6d. to 6s., excepting the Doyenne du Comice, which made fancy prices, the best fruit of this variety realizing from 18s. to 24s. per box.

At the beginning of April the prices were very good, 5s. to 8s. being the average for different varieties, excepting Doyenne du Comice, which made 12s. to 15s. per box.

The later shipments (the last arrival being on the 13th May) consisted chiefly of Easter Beurre, Keiffers, and Glout Morceaus. These made poor prices, the market being rather full with Tasmanian pears and apples which usually arrive in large quantities in April.

In summarizing the average prices for the different varieties of pears for the past season, I find the following result. The prices given are for good, sound fruit only:—

	Per Box. s.	d.
Doyenne du Comice	14	6
Josephine de Malines	7	6
Glout Morceau	6	3
Beurre Bosc	6	0
William Bon Chretien	5	9
Louise Bonne	5	3
Winter Nelis	5	3
Clapp's Favourites	4	6
Keiffer	4	0
Easter Beurre	4	0

It is, of course, understood that, in addition to the above, other varieties of pears were also shipped, but they did not arrive in sufficient quantities to enable me to form a fair idea of the average value.

It must be noted that the two last-named varieties (Keiffers and Easter Beurre) are included in the list of those varieties which the

Special Committee of Fruit Growers recommended should not be shipped.

A few growers also shipped Cape Winter Safraan. These realized only 1s. 6d. to 2s. 6d. per box, and as I have repeatedly said in my reports and verbally, it is not the slightest use shipping this variety of pear to the London market.

Though it is advisable with most other fruit to cultivate a very early, a middle, and a very late variety with a view of extending the shipments over as long a period as possible, I cannot see that, in the case of pears, much, if any, advantage is to be gained by shipping the late varieties as they come in competition with large shipments of pears from Tasmania.

I am pleased to be able to say that South African pears are the best and most appreciated of any of this class of fruit received from abroad, and I would advise growers to devote a great deal of attention to this section of the fruit trade.

Grapes.—It is gratifying to report that there has been a considerable increase in the shipment of grapes during the past season, the total quantity exported being 860,300 lb. as against 468,060 lb. the previous year. (As the grapes are now arriving in different sized boxes and crates, it is better for me to give the quantity in pounds.)

The fruit, owing to improved packing, arrived in better condition than previous years, and, in consequence of this and of better selection, made higher prices.

In giving the prices of grapes I am basing my calculations on 10-lb. boxes, or quantities of 10 lb., for purposes of comparison, the prices in each case being for sound or fairly sound fruit only.

The first shipment of grapes arrived the first week in January. It consisted of the Black Prince variety and realized from 3s. to 5s. per 10-lb. box. These grapes are not appreciated on account of their small berries, and I have on previous occasions recommended that this variety should not be shipped.

During the month of February the shipments consisted principally of Hermitage, which realized an average of from 4s. to 8s. 6d. per 10-lb. box.

The prices for the different varieties of grapes during the remainder of the season were more or less regular.

With the view to showing the average prices throughout the season of each variety, I have divided the "older" and better known types which come over in large quantities and form the bulk of the grape shipments from the "newer" varieties which came only in small quantities. I have adopted this course because it is not advisable to compare the prices of a very small shipment of certain types with large bulk shipments of other varieties.

"Older" Types.

	Per Box. s.	d.	
Red Hannepoot	6	9	per 10 lb.
Barbarossa	6	6	,, ,,
Raisin Blanc	6	3	,, ,,
White Hanepoot	6	3	,, ,,
Hermitage	5	6	,, ,,

"Newer" Varieties.

	s.	d.	Per Box.
In small shipments:—			
Waltham Cross	9	6	per 10 lb.
Gross Colma	9	0	,, ,,
Karoo Belle	9	0	,, ,,
Flaming Tokai	7	0	,, ,,
Lady Downe Seedling	6	0	,, ,,

It must not be inferred that the above prices will be maintained if large bulk consignments of the newer varieties of grapes are shipped, but it is clear that these newer types of grapes are appreciated on the market, and they have proved themselves to be good keepers; the results of the experiments should encourage growers to continue shipments.

The Waltham Cross, though not equal in flavour to the Muscat (Hanepoot), were much appreciated in consequence of their fine, large berries and good travelling qualities, and made good prices—in some instances 1s. per lb. wholesale. I consider this grape has great possibilities. The same may also be said of the Gross Colma and Karoo Belle.

In regard to the Lady Downe Seedling I have to state that those received during the past season were not so good as I have seen in former years, the berries generally being very small and the bunches very scraggy.

The Flaming Tokai is also a good type of grape and is well known on the market. It possesses good travelling qualities, but is not so good in flavour as the others.

I have dealt so fully in my previous annual reports with the question of packing and transportation that I do not consider it necessary to deal fully with the matter again. I will only remind growers that Cape grapes come closely in competition with hot-house grapes, especially with those from Belgium, with which ours are compared for appearance. Hot-house grapes which have never been exposed to wind or sun, and which have been thinned out and carefully conveyed to the markets, are certainly very fine, being free from blemishes and having large berries, loose bunches, and natural bloom. This is what the Cape growers have to aim at. Their first endeavour must be to produce large berries and medium-sized bunches, with the berries loosely grown on the stalk. The bunches must be regular in shape and more or less of uniform size, and must have the bloom on when marketed. The Hanepoot grapes comply with the above requirements more than any other variety from the Cape, and it should be remembered that red and black grapes have the better appearance, as blemishes caused by wind and sun are not revealed to the same extent as on the white grapes; there is, however, always a limited demand for white grapes.

During the season under review, in consequence of the shipments of white grapes having been reduced in comparison with those of the red grapes, the former realized rather better prices and in some instances have made similar prices to the red grapes. But I still recommend that the bulk of the shipments of grapes be of the dark coloured varieties.

I have again to urge growers to make experiments with the

growing of grapes for export on trellises. I have reason to believe that grapes thus grown will be more hardy and receive more protection from sun, wind, and dust. They would consequently have a much better appearance, besides which this method of growing grapes would make it more convenient for thinning out, which I consider an essential process in connection with the production of grapes for export.

I have in my previous annual reports recommended growers to experiment with the system of packing in crates and baskets, and have dealt very fully with the subject. The results of these experiments have not been quite so successful as I anticipated, that is some of the commission agents on Covent Garden consider that this method of packing has not proved beneficial to the shippers; others, however, are in favour of it. But neither is the old system of packing in 10 and 20 lb. boxes with wood-wool quite satisfactory, and it is therefore very necessary that shippers should continue experiments in the direction of baskets and crates.

It will be remembered that in my former reports I recommended trials to be made with three sizes of crates and baskets to ascertain which was the most suitable. It is remarkable that nearly all the shippers who kindly took part in these experiments adopted either the largest size crate recommended by me, or a still larger crate, with very large baskets which I did not recommend, and this seems to have been the principal objection amongst dealers on this side, as they consider the package too large to handle. I would, therefore, now recommend shippers to adopt a still smaller size crate, the inside measurements to be 20 in. by 8½ in. by 13½ in. and to hold eight chip baskets, without handles, measuring 10 in. long, 6½ in. wide, and 3 in. deep. I consider each basket should hold about 3 lb. to 3½ lb. grapes.

I have recently caused several sample crates and baskets to be made, and have submitted them to agents of shippers on this side for their consideration. and we have now fixed upon what is considered to be the most suitable crate and baskets, a sample of which will be forwarded to the Agricultural Department at an early date, together with a report from me containing instructions as to the methods of packing and handling this crate.

Almeria Grapes.—The question of growing the Ohannes grape, better known by the name Almeria, has been fully dealt with by me in my last three annual reports, in which I recommended that experiments should be made by farmers in different parts of the Union to grow these grapes on different parts of their farms at varying altitudes and under different conditions. I now feel satisfied that a good many farmers are making these experiments, and await results. For the guidance of these farmers and others I will again point out that in the Province of Almeria, in Spain, where these very hardy grapes are so successfully produced, the vines are grown at an altitude of about 2000 to 3000 feet, in a dry climate with a small rainfall, well-drained deep soil which has to be irrigated. The vines are supported on trellises about 6 to 7 feet high. Cuttings for new vines are always taken from specially selected stock which has produced grapes possessing great keeping qualities.

I would remind growers that the object of their experiments must not be only to see whether they can produce these grapes like

those in Almeria, but to determine whether they can produce them to retain their marvellous keeping qualities, for it is this that makes them so valuable and has established them amongst the great articles of commerce.

If South African growers can produce these grapes to retain their splendid keeping qualities there need be no fear of flooding the market. The following tables will show the enormous quantities of grapes of all varieties imported into England only, while New York and Hamburg together take almost a similar quantity:—

TABLE A.

SHOWING QUANTITY AND VALUE OF GRAPES IMPORTED INTO THE UNITED KINGDOM DURING THE YEAR 1910.

	Cwts.	Value.
January	1,738	£5,469
February	1,282	6,262
March	2,445	11,625
April	2,785	17,742
May	1,176	4,844
June	525	2,622
July	1,409	4,542
August	71,024	58,638
September	156,514	141,038
October	304,932	291,347
November...	124,672	122,954
December...	5,327	12,834
	673,829	679,917

TABLE B.

GRAPES IMPORTED INTO THE UNITED KINGDOM, SHOWING COUNTRIES OF ORIGIN.

During the Year 1910.

	Cwts.	Value.
Belgium	7,430	£37,743
France	85	116
Portugal	68,886	34,687
Spain	573,521	498,350
Other foreign countries... ...	3,164	9,195
Total from foreign countries	653,086	£580,091
Channel Isles	15,180	77,925
Cape of Good Hope	4,832	21,184
Other British possessions ..	731	717
Total British possessions ...	20,743	£99,826
Grand total	673,829	£679,917

Explanations.—Table A shows that out of a total of 674,000 cwt. 657,000 cwt. arrived during the months of August, September, October, and November, almost all of which are from Almeria. These

grapes are stored and subsequently placed on the market in bulk during January, February, and March.

Table B.—Out of the total quantity of 674,000 cwt. 573,000 cwt. are from Spain, and about 69,000 cwt. from Portugal. It may be assumed that at least 90 per cent. of these grapes are of the Almeria varieties, or something approaching that type.

It will be observed that comparatively small quantities of grapes arrive during the early part of the year up to April and May, and about half the quantities shown in Table A for these months come from South Africa. Therefore I consider that if South African growers can produce Almeria grapes of good, sound keeping quality they will have no difficulty in competing with the grapes from Almeria during the months of March, April, and May, as the South African grapes will then be of the new season's crop compared with the stored grapes from Almeria.

The prices paid for Almeria grapes per barrel for the respective months of the past season 1910-11 are as follows:—

	s.	d.		s.	d.
September	6	6	to	9	0
October...	8	6	,,	11	0
November	9	0	,,	16	0
December	11	0	,,	16	6
January	16	0	,,	21	0
February	16	0	,,	21	0

After the middle of February the sound grapes are repacked from the barrels into 12-lb. baskets. The following were the market prices:—

February, 6s. to 8s. per 12-lb. basket.
March and April, 6s. 6d. to 8s. 6d. per 12-lb. basket.

A barrel contains about 45 lb. to 50 lb. of grapes and 8 lb. of cork-dust.

In a former report I suggested the shipment of these grapes from South Africa in boxes to hold about 30 lb. net weight of grapes, packed in about 4 lb. of cork-dust, which will cost about 3s. 9d. per box, including all charges from the vineyard to the market and London expenses. It is not necessary to ship these grapes in cold storage, the ventilated holds of the steamers being quite good enough.

Melons.—The quantity of melons received last season amounted to approximately 1200 (cases and barrels), as against 750 for the previous year.

The first shipment arrived on the 11th February, and realized from 1s. to 2s. 6d. per melon, when sound.

During the end of February fairly large shipments were received in barrels, which were wrapped in paper and packed tightly in wood-wool and shipped in the ventilated hold. They arrived in a very sound condition, and realized an average of from 6d. to 1s. 3d. each. I am informed that portions of these consignments were bought by New York fruit dealers and transhipped to America.

Further shipments were received during March and up to the end of April, prices for sound fruit during this period being from 6d. to 1s. 6d. each.

The large bulk of the melons received were of the winter (smooth

skin) variety, but small lots of "netted" and other varieties were received. I think it has already been amply proved that the winter (smooth skin) variety is by far the most profitable to ship.

I am glad to report that a fair trade has now been established in this class of fruit, and the quantity shipped is likely to increase.

Mangoes.—During the fruit export season under review four trial shipments of mangoes were consigned to me from the Barberton District, amounting approximately to 500 boxes.

The first shipment arrived on the 18th February and the larger portion of the fruit was found to be over-ripe and affected with black spots; many of the mangoes were quite black and unsaleable. One mark only realized 7½d. per box, while another mark in a fairly sound condition realized from 9d. to 1½d. per mango, according to condition and size of the fruit.

Fruit dealers considered that the first consignment of 150 boxes was too much for the market, as the fruit is not well known to the public, the demand being very limited. The mangoes in this instance were of the Kidney variety.

With the exception of one mark the shipment following arrived in a good condition; the sound fruit realizing from 1s. to 4d. each fruit, according to condition and size. One mark was again wasty, realizing only 7½d. per box (counts of twenty to thirty), and many of the fruits were quite black and rotten, others being badly spotted and unsaleable, except for making chutney.

The third shipment included a small quantity of the Long Green and Peach varieties. They arrived in a good condition and realized from 1s. to 6s. each fruit, according to size.

The Peach mango appears to be the variety most appreciated on these markets, but the Kidney variety is also good.

It is considered that the exceptional prices mentioned above would not be realized when large quantities arrive.

It is worthy of note that almost all the wasty mangoes included in these shipments were received from one grower. It is hoped that he will continue his experiments and pack under different conditions with the view of ascertaining the cause of the bad condition before mentioned.

The average prices realized for the four shipments were 4s. 3d. per box net, and considering the large proportion which were sold at 7½d. per box I consider this price very satisfactory.

Though there is only a limited demand at present for this class of fruit I think it will expand as the fruit becomes better known.

Growers should confine themselves at first to small trial shipments with different varieties of fruit, packed in different conditions of ripeness.

The class of mango most desired on these markets is one of fairly large size and a good bright colour.

Pines.—The total quantity of pineapples exported from South Africa during the year 1911 was approximately 8200 compared with 1600 boxes in 1910.

The first shipment from the Cape Province came to hand about the middle of March. The pines were rather small, but satisfactory prices were realized, viz., about 5s. 6d. per dozen. Prices were higher last year, but it must be remembered that the quantities were much smaller. During the latter end of the season most of the pines from the Cape were affected with heart-rot.

During March arrivals were very heavy in comparison with other months, and it is rather interesting to note that notwithstanding the increased quantity upon the market the prices showed no appreciable fall.

The best months for the export of pines are February, March, April, and May.

During April the best prices were realized owing to the small arrivals from the Azores; the large pines from South Africa realizing 1s. to 3s. 6d. each, according to size and condition. This yields a handsome profit to the grower.

The growing of the larger types of pines should be encouraged; those which arrived from South Africa were much appreciated, and I consider a good market can be established for them.

The size of the box recommended for packing six large pines is 16 in. by 6 in. by 30 in. (inside measurement).

The box found to be the best for the small Queen pines measures 14 in. by 4½ in. by 27 in. (inside measurement), with a centre division, and to hold one dozen fair size fruit. Coarse wood-wool has so far proved to be the best packing material for pines.

Only good sized fruits should be sent. They should be picked when just turning colour, and should be shipped in the ventilated hold from Cape ports, while the cold storage has given better results for shipments from Natal.

If pines are shipped in a very green state in the cold chamber they will arrive here in that condition and will not colour up after arrival but turn rotten; pines to be shipped in cold storage must show a great deal of colour before cutting.

Some experiments were made from Natal (Winkle Spruit Government Experimental Farm) in the early part of the season, commencing with a shipment on the 31st December, 1910, and terminating on the 22nd April, 1911. Both cool chambers and ventilated hold were used. The pines were shipped in different stages of ripeness. In almost every case the fruit was affected by heart-rot, and was unsaleable. The heartrot was examined by the authorities of the Royal Botanic Gardens, Kew, who reported:—

"That the disease which is known as heart-rot is purely physiological in its nature, and is brought about by an excess of moisture in the atmosphere which checks transpiration and thus prevents the translocation of certain substances in the fruit. In order to ensure the production of good sound fruit, translocation should take place quickly during the period of rapid growth and ripening.

"The occurrence of this diseased condition appears to coincide with the rainy season in South Africa when the air is heavily laden with moisture.

"The same diseased condition has been noticed in pineapples grown in this country when the atmosphere here has been allowed to approach saturation during the ripening period. A similar heart-rot of apples is prevalent in the United States during an exceptionally wet season.

"The central browning is not in any way influenced by the stalk. The browning commences in the centre of the pine, i.e. equally distant from each end and gradually extends towards the two ends."

Further experiments are certainly desirable in both cool chamber and ventilated hold, not only from Natal but from the Cape Province.

Probably by a careful selection and shipment of further experimental lots of pines grown at different altitudes and in different soils from districts where the climatic conditions differ, we should be able to determine which districts give the best results, and we should be better able to judge whether it is essential to change the variety of pineapple for export oversea.

One final word I would give and that is that in the cutting and through all stages of handling pineapples they should be treated delicately, i.e. with the utmost care to prevent bruising and specking.

Apples.—I recommend that greater attention be paid in South Africa to the cultivation of marketable varieties of apples. This is a fruit in universal demand, and if it can be successfully grown and exported on a commercial scale (and there is no apparent reason why it should not be), we are convinced here that it will make a very profitable addition to the South African fruits coming on to these markets.

Some of the best varieties to grow for export are Cox's Orange Pippin, Blenheim, Newtown Pippin, Jonathan, Pearmain, and Rome Beauty.

The best time to place apples on the market from South Africa is during February, March, and April, i.e. between the American and Australasian seasons.

I am aware of the difficulties that have been experienced in the past, particularly as regards the "bitter pit" in apples from South Africa, but probably by careful selection of soils, climates, and districts, and by taking advantage of the teaching of horticultural science, former difficulties will be overcome.

Mr. Harrison—when Commercial Agent for Natal—submitted a report (dated 4th December, 1908) to the Agricultural Department of that Province dealing fully with the methods and materials in packing, varieties, transportation, and prices realized by other apple-exporting countries, which report may be referred to.

Although a few small trial lots have already been consigned to Covent Garden, I recommend that systematic experiments be carried out as early as possible to establish a real test of the marketable varieties of apples now produced in the Union and to determine the defects that have to be remedied.

Trial shipments of apples from the Bathurst District and from the Orange Free State proved very successful, and in every case there was a remarkable absence of "bitter-pit".

C. DU P. CHIAPPINI,
Trades Commissioner.

10th November, 1911.

Notes.

Dips and Dipping Tanks.

Applications for loans for the purpose of erecting dipping tanks continue to pour in from all quarters. The Veterinary Division is almost daily receiving encouraging reports of the benefits which are being derived from their use. In one or two instances, however, accidents have happened by reason of lack of proper care in the preparation of the dip, and for that reason we take this opportunity of pointing out to all those who intend dipping their cattle that, although arsenical dips can be used safely and without risk if the instructions for preparing and using them are carried out, the chief ingredient of the dip, arsenite of soda, is a powerful poison, and in making a dip ready for use every care should be taken to see that the various ingredients are weighed and measured and the proper amount of water is added. On no account should farmers attempt to guess the quantity of arsenite of soda which is being added to an uncertain quantity of water, as such methods are likely to lead to trouble. The East Coast fever pamphlet mentioned by Government Veterinary Surgeon Dixon, which contains full instructions for the preparation of cattle dips, will be sent post free to any applying for it.

Inoculation Against Horse-Sickness.

A correspondent having inquired for particulars, the following memorandum was issued by Dr. Theiler, Director of Veterinary Research:—

"The inoculation of horses against horse-sickness has been introduced for the first time this year, but only in an experimental way. This course is necessary in order to see how the method can be applied in practice and what the results will be.

"If the initial experiments prove successful the method will be gradually introduced throughout the Union, but at the present time it would be impossible to promise any applicant immediate attention.

"The operation cannot be undertaken by the proprietor, but has to be carried out by a Government veterinary surgeon.

"All matters connected with the method will, however, be regulated when the trial experiments in practice prove successful."

London Show of South African Fruits and Vegetables.

With reference to the Royal Horticultural Society's Show of South African Fruit and Vegetable Products in London, 14th, 15th, and 16th March, 1912, Transvaal fruit growers are notified that their exhibits should be ready for dispatch so that they may reach Pretoria for examination and possible repacking not later than the 10th February. It is recognized that the date is not one on which it is

possible for the Transvaal Province to make a display of citrus fruit or mangoes, so those sections are eliminated. Some good exhibits of apples and pears are possible, and orchardists who intend to support the show and assist the industry by sending fruit are reminded that the Royal Horticultural Society intends offering both gold and silver medals and certificates by way of award. It is hoped that this notice will meet with a good response, and in order to as far as possible ensure that result it may be stated that all expense in the way of rail and sea transport, etc., is borne by the Government. All the grower has to do is to wrap his fruit and pack it as nearly as possible in the regulation size box, which is for apples $20 \times 11 \times 10$ (inside); pears, $18 \times 12 \times 5$ or $18 \times 12 \times 6$; particulars as to procuring these may be had from the Government Horticulturist, Agricultural Department, Pretoria. The ends of the boxes should be marked with the grower's name and address and delivered free to the nearest railway station addressed to the Government Horticulturist, Pretoria. It must be noted that the Department reserves the right to return to the owner and decline to forward for exhibition any fruit which does not come to the desired standard. As the exhibition is intended primarily to advertise such fruits as may be of commercial importance in the export business between South Africa and the United Kingdom and Europe, it will be seen that no good purpose would be served by sending exhibits of fruits other than those which can be supplied in bulk, and for that reason it is not desirable to forward samples of peaches, plums, etc., from this Province.

Government Guano.

With a view to assisting farmers in procuring Government guano, arrangements have been made with the Railway Department whereby supplies of this product may be obtained direct from Capetown through the medium of local station masters. Applications for guano, accompanied by payments in advance, may therefore now be placed with any station master within the Union of South Africa. The price of guano is £5 per ton of 2000 lb., or 10s. per bag of 200 lb., including bags, delivered to the Capetown railway station. All railage charges are payable by the consignee, and in case of guano consigned to sidings these charges must be prepaid.

Importation of Potatoes into the Union of South Africa.

The Minister of Agriculture of France having given an assurance to the Minister of Agriculture of the Union of South Africa that black scab or wart disease of the potato caused by *Synchytrium endobioticum Percival* has not been known to occur in that country, and also having undertaken to advise that Minister of any outbreak of such disease, consignments of French potatoes will be accepted in future from that country without the usual official certificates. (*Vide* Section 3 of Proclamation No. 210 of 1911 and Government Notice No. 1361 of 1911.) Declarations, of course, from consignors, stating where the potatoes were grown and giving data establishing the identity of the consignments will be necessary as heretofore.

Dairy Instructors for the Union.

We are instructed to announce that the services of Dairy Instructors are now available for all the Provinces. Mr. L. J. Veenstra has been appointed Dairy Instructor for the Transvaal, which Province has now come into line with the Cape and the Free State in this respect.

It may be notified for general information of farmers, dairymen, and breeders that competent instructors have been appointed whose services are available for practical and demonstrative instruction and advice on the following subjects:—

Feeding, stabling, and rearing of dairy herds.
Improvements in dairying.
Creaming and separating.
Butter-making and hard and soft cheese-making.
Testing and investigating dairy products.
Matters relative to the dairy industry in general.

Farmers, dairymen, and all others wishing to avail themselves of the above are requested to notify their intentions to the Superintendent of Dairying, Agricultural Department, Pretoria; for the Free State to Dairy Instructor W. Oosterlaak, Bloemfontein; and for the Cape to Dairy Instructor T. R. D. Carruthers, Capetown.

Dairying in the Free State.

In the monthly report for October of the Superintendent of Dairying the following gratifying comments appear with reference to dairying in the Free State:—

"In the Free State there is a very great demand for the services of the Dairy Instructor which is noted with great satisfaction. The season promises to be very fine indeed. For the month under review it is estimated that the increase in supplies of cream to the seven established creameries in that Province will amount to something like 20,000 lb. over the corresponding period of last year. The prospects indicate a record year. Keen interest is manifested in all parts by the farmers, who are adopting the most up-to-date methods, and they are procuring first-class dairy stock. Instruction and advice are sought and readily accepted."

Insect-Borne Diseases.

The Rhodesia Scientific Association's gold medal, recently offered for an original paper advancing the knowledge of the transmission of any insect or arachnid-borne disease affecting Rhodesia, has been awarded to Edward Hindle, Ph.D., A.R.C.S., F.L.S., Magdalene College, Cambridge, Beit Memorial Research Fellow, for his paper on "The Transmission of *Spirochaeta Duttoni*". The paper will be read at the meeting of the Rhodesian Landowners' and Farmers' Association to be held on the 26th January, 1912.

Senator Marks' Dry-Farming Competition.

1. Mr. F. J. van Zyl, Platrand, District Standerton, two prizes, one for wheat and one for oats = £20. Mr. Van Zyl grew 8 morgen

of Red Victoria Wheat and 13 morgen of Algerian oats on dry lands and conformed with the regulations.

2. A special prize of £10 was also given to Mr. T. Manuell, Rietfontein (Pretoria-Johannesburg railway line), Transvaal, for general crops grown on dry lands. This farmer has 100 acres of land under cultivation and grows wheat, oats, maize, teff grass, mangels, and potatoes. He is also a dairy farmer and keeps 120 head of dairy cattle and six horses, all of which are fed during the winter and summer months on the products of his farm.

3. A special prize was also awarded to Mr. G. R. Ockerse, Blauwboschkuil, Springbokflats, for 8 acres of sugar beets. If sugar beets can be profitably grown on the dry lands of South Africa it opens out an enormous field for the manufacture of sugar and this award is intended to encourage pioneer effort.

Building a Weir.

A correspondent asks for an answer to the following questions through the medium of the *Agricultural Journal*: I want to build a weir through a valley, the valley being about 12 feet broad at the bottom and about 40 feet at the top. The drop in the valley is about 1 in 50. The weir to be 12 feet high. What breadth would it have to be and which would be better to use in construction, concrete or stone and cement?

The Director of Irrigation states: The top width of such a weir should be 2½ feet; the upstream-face should be vertical and the downstream-face should slope 1 in 1½. It should be well founded upon rock or other hard ground, and the downstream-batter should continue to foundation level. Concrete is more expensive than masonry owing to the cost of breaking the stone and the greater consumption of cement; equally good results will be obtained from masonry provided that it is carefully built and all spaces are well filled and fronted with mortar.

Queen Bees from Fertile Worker's Eggs.

Mr. W. Terrell, of Retreat, near Capetown, writes:—In your issue of the *South African Agricultural Journal* for October, I noticed Mr. H. L. Attridge's reply to Mr. Brown's query *re* "the production of a queen from a fertile worker's egg". I take it from the reply that Mr. Attridge has no definite knowledge on the subject. I am quite well aware that all the textboks published, *South African Bee-keeping* included, contain the same assertion "that from a fertile worker's egg a drone can be the only result". It is generally accepted that if a virgin queen lays eggs the production from such eggs will be drones. I suppose it is by following this line of reasoning that the eggs of the fertile worker must also produce drones. Now parthenogenesis is well-known to entomologists, and all our best authorities on bees admit that parthenogenesis extends to the bee, but somehow or other it only applies to the drone, which is admitted to be a fatherless bee. Why can't a bee reproduce itself in the fullest sense of parthenogenesis? When a perplexed bee-keeper brings a case to his expert of a queen having mysteriously appeared in a hive,

which he felt sure was queenless, and in which he felt quite as certain that there were neither eggs nor larvae from which a queen could be reared, he is told by his advisor "you did not notice that naughty little queen cell on that out of the way comb", or he repeats that fanciful story of the purloining of an egg from a neighbouring hive. "It may be that you missed seeing the queen that was there" which is a common occurrence in an ordinary manipulation, and if you were quite positive she was not there "she must have been out for a walk at the time of your examination". Many such cases have happened to me, but I was always content to accept the verdict of our bee-fathers and write down my observation as another blunder, until I saw a statement in your *Journal* by a Mr. Onions, that a queen could be reared from a worker's egg. Then I set to work and tested the thing for myself, and Mr. Brown or any other intelligent bee-keeper can prove the thing to his own satisfaction. If one can't convince one's expert it is something to be satisfied oneself. If you care to go to the trouble you will find that a laying worker will lay eggs that drones, workers and queens can be reared from. I have been successful in mating queens reared from worker's eggs.

A Revolutionary Theory.

This letter was referred to Mr. H. L. Attridge who sends the following comments:—Your correspondent makes a statement which if true would revolutionize the whole system of bee-keeping, but as it is so utterly at variance with our knowledge of the physiology and anatomy of the honey bee and a contradiction of known laws, I think it is incumbent on Mr. Terrell to give some proof of his assertions before expecting the bee-keeping world to accept his story. Mr. Terrell suggests that I "have no definite knowledge on the subject". Perhaps not. I admit twenty-five years close study of bee-life is not sufficient time to acquire a full knowledge of all their habits and I am quite prepared to learn anything further on the subject, but with regard to the theory Mr. Terrell now advances there is nothing new about it. I might inform Mr. Terrell that I am fully aware of the disclosures made by Mr. Onions, an enthusiastic bee-keeper, some few years since. I also remember that gentleman's promise to supply us with the results of his investigations, for which I am still waiting. Mr. Terrell now trots out the same old horse and practically makes the same statements without a vestige of proof. If there is anything in this theory, seeing the far-reaching effects it would have in the universal management of bees, I submit that it is quite time this discovery was made known for the benefit of the apicultural world. I am quite prepared to answer Mr. Terrell when there is something tangible to work upon, but I cannot see any useful purpose in opening up a controversy at this juncture. I purpose dealing with the whole question in the shape of an article when I have a little leisure at a later date. For the time being I am prepared to stand by my answer to Mr. Brown's query, published in the October issue of the *Agricultural Journal* as being in harmony with modern practice and experience, and as far as authoritative knowledge goes at present. With regard to the "fanciful", as Mr. Terrell suggests, I suppose most bee-keepers with some practical knowledge of the subject will readily admit that eggs are frequently removed from place to place

in a hive, and this by the worker bees. And every one is acquainted with the pilfering habits of bees where honey is concerned. It is also well known that bees of queenless hives are in a state of great agitation for some days after the death of their queen, and may frequently be seen endeavouring to obtain admittance to adjoining colonies. It is, therefore, no stretch of imagination to believe that on rare occasions they may gain admission to neighbouring hives and beg, borrow, or steal a nice large egg for the purpose intended, always with the proviso, however, that it was not laid by the worker. I would note that the numerous passages in your correspondent's letter, placed under inverted commas, are not quotations or extracts from my writings on bees or bee-keeping.

The Feeding Value of Lupines.

The following extracts from Volume 2, "Cedara Memoirs"—"Feeding Crops and Live Stock Experiments", were forwarded to a correspondent in reply to a query:—Had the lupine an unblemished reputation as a fodder crop the difficulty of working out a profitable system for such a farm as Cedara would be at an end, for this legume grows freely and luxuriantly on all classes of soil represented at this centre, and even better through the dry than in the wet season.

In the form of green forage, hay or grain, the lupine is used in Europe as feed for sheep, though they show little partiality for it in Natal. On account of its bitter taste it is not palatable to horses and cattle, but may be mixed in small proportion with other foods. Stephens, in his "Book of the Farm", says: "The stems make excellent hay, and the seeds are found to be very superior as food for sheep, lambs, and fattening wethers. They are also given to horses and cattle, mixed with oats or beans; and lupine meal is given with milk to calves." McConnell says: "Lupineseed meal is a desirable ingredient of all milk substitutes for calves." Armsby, in his "Manual of Cattle Feeding", says: "The Yellow Lupine yields, when cut just at the end of flowering, the most highly nitrogenous of all coarse fodders. Experiments by Heidepreim on lupine hay cut just as the pods were beginning to form, showed that it contained the enormous quantity of 27.8 per cent. of protein in the dry matter. The digestibility of the protein by sheep was found to be 74, that is, almost the same as in vetches or lucerne." The lupine thrives on a light, sandy, and dry soil, giving at Cedara a better return when grown during the winter without irrigation than as a summer rain-crop. It is undoubtedly a splendid renovator of poor or exhausted lands, but must be fed even to sheep with caution, and only in combination with other feeding-stuffs less rich in protein. At various times poisonous effects have been observed to result from the feeding of lupine hay to sheep. These have been frequently ascribed to the alkaloids it contains. More recent investigations indicate that the amount of alkaloids present in the hay is too small to produce evil results, and that the cause is to be sought in a fungus which attacks the crop under certain, as yet unknown, conditions. Von Muller says: "The lentil-like seeds are very fattening when used as an addition to ordinary fodder, and are in this respect quite equal to oil-cake." The bitter principle (*lupinin*) may be removed by boiling or soaking in salt water.

Soya Beans as Stock Food and Fertilizer.

A high percentage of oil and proteid matter renders soya beans too rich to be used to any considerable proportion in a ration for ordinary feeding purposes. The relatively high price of soya bean oil (£22 per ton, London), compared with that of the beans themselves (£7 to £8 per ton, London), is also an argument for the crushing of the bulk of the crop and the use of the resulting cake or meal for stock feeding rather than the direct use of the beans for this purpose. That the soya bean cake as a commercial article has little less importance than the oil may be deducted from a comparative statement of the prices of the principal stock cakes six years ago and at the beginning of the present year:—

	1904.			1910.		
	£	s.	d.	£	s.	d.
Linseed	1	13	3	2	18	0
Linseed oil	16	9	6	33	15	0
Linseed cake	6	15	10	9	5	0
Cotton seed	5	19	9	9	8	9
Cotton seed oil	16	13	3	29	0	0
Cotton seed cake	4	10	9	8	12	6

In view of this unexpected advance in the price of the two staple oil seeds and their products, the new feeding material has been welcomed as a substitute for the decreasing supplies of cotton seed cake. The following typical analysis of soya bean cake reflects its high feeding value:—

Moisture	11.40
Oil	6.12
Proteid compounds	42.78
Starches, sugars, etc.	28.41
Woody fibre	5.70
Ash	5.59

It will be noted that of the 17 or 18 per cent. of oil present in the bean, not more than from 10 to 12 per cent. is extracted by process of crushing. Soya bean meal differs from cake in that the oil is extracted by chemical solvents, and not by the process of crushing. In such cases only 1½ to 2½ per cent. of oil remains. The present London value of the cake (10th October, 1910) is from £6. 17s. 6d. to £7 per ton, as compared with £8. 7s. 6d. to £8. 12s. 6d. paid for cotton seed cake. As a result of numerous practical experiments, however, soya bean cake or meal may be stated to have at least an equal feeding value to good decorticated cotton seed cake or meal.

Live Stock Experiments.—The prospect of large local supplies of this valuable stock food for the winter feeding of dairy cows and sheep will be welcomed by progressive owners, and should materially influence the output of dairy products during the winter season. Its successful employment, however, will be determined by the establishment of suitable proportions of the bean cake and other ingredients of the ration, and in this connection the results of experiments will furnish useful guidance. Speaking generally, it has been found advantageous, if not absolutely necessary, to use the cake in conjunction with some food containing a relatively low percentage of oil and protein, such as maize. One experiment, reported by Professor Gilchrist, of Armstrong College, was carried out at the Cumberland

and Westmoreland Farm School, and was intended to test the comparative feeding value of soya bean cake and decorticated cotton cake. Three cows and two heifers, after their first calf, were selected in February, 1909. They were all at an early stage of their lactation period, and as the milk naturally declined in quantity as the trial progressed, it was decided to feed soya bean cake during the first and last three weeks, and decorticated cotton cake during the middle six weeks. Each cow received daily 49 lb. swedes or 42 lb. mangolds, 14 lb. hay, 7 lb. oat-straw, 4 lb. crushed oats, and 4 lb. soya bean cake or 4 lb. decorticated cotton cake.

As regards milk production, there was a slight advantage in favour of the soya bean cake, but it was so small that the two cakes were considered to be equal in this respect. Both foods also gave similar results as regards the fat content of the milk. The cows gained rather more in weight while they were receiving the soya bean cake than they did on the decorticated cotton cake.

An experiment on similar lines was conducted at the Royal Agricultural College, Cirencester. Six cows were selected from the college herd, and divided into two lots of three each, care being taken that the age, period of lactation, and quantities of milk per day were as nearly equal as possible. The cows were turned out to grass on 5th April, and the experiment lasted from 12th April to 9th May. The daily rations were 35 lb. pulped mangolds, 6 lb. to 8 lb. chaff, 2 lb. ground oats, 1 lb. bran, and a small allowance of hay. Lot No. 1 received in addition 4 lb. soya bean cake, and Lot No. 2 4 lb. decorticated cotton cake; the bean cake contained 6 per cent. of oil and 40 per cent. of albuminoids (proteid matter), and cost £6. 10s. per ton, while the cotton cake contained 8 per cent. of oil and 34 per cent. of albuminoids, and cost £7. 10s. per ton. The yield of milk appeared to be little affected by the kind of cake used. The percentage of butter fat in the case of the bean cake remained almost constant, a slight increase, if anything, being noticed; while in the decorticated cotton cake the percentage of butter fat had a tendency to fall. The butter produced by the bean cake was of a soft, oily nature and quickly churned, but it yielded well. It was, however, of a decidedly paler colour and somewhat inferior flavour as compared with that from cotton cake. The butter produced by the decorticated cotton cake was hard, and took a longer time to churn. The yield, however, was not so good as from the bean cake. No difference in laxative effect or otherwise was observed in the two cakes.

Another experiment on a small scale was carried out at the Harper Adams Agricultural College with two rather delicate heifers to test the question of the possibility of this cake having any detrimental effect on animals. Increasing quantities up to 7 lb. a day were given to one animal without any ill-effects, and the cake was eaten with relish. The other heifer was fed on a patent cake, and then a sudden change made to soya bean cake, and in this case also

no difference was observed. An experiment, carried out in Germany, at the Agricultural Institute at Bonn, is reported in the *Deutsche Landwirtschaftliche Presse* (22nd and 26th May, 1909), in which soya bean cake was compared with linseed cake for feeding cows. The experiment was of a very exhaustive character, but only included three cows, which were fed for a fortnight at a time on linseed cake, soya bean cake, and again on linseed cake. The results showed little difference as the result of the feeding, and the conclusion arrived at was that soya bean cake was a quite satisfactory food for cows. The foregoing experiments and the analyses which have been made show that this cake may be regarded as a useful feeding stuff when given to stock in suitable quantities and in combination with other foods. It is, however, rich in albuminoids, and if not fed judiciously may give rise to digestive troubles. Analyses show that it approaches decorticated cotton cake in composition, and should be fed in the same way as that cake, with roots, hay, and straw.

The Agricultural Department of the University College of North Wales have conducted a very interesting feeding experiment involving the use of soya bean cake with sheep. Two lots of sheep—fifteen in each lot—were selected. Lot No. 1 received sliced swedes, hay, ¼ lb. per head crushed oats, ¼ lb. per head soya bean cake. Both lots had as much swedes and hay as they would eat, the amounts consumed being practically the same in both cases, 7 lb. of swedes and ¾ lb. of long hay per head per day. From 10th January until 10th March the sheep in Lot No. 1 gained 125 lb., whereas those in Lot No. 2, which were fed on linseed cake, gained 154 lb., an increase of 29 lb. over those fed on the soya bean cake. From 10th January to 10th March Lot No. 1 consumed 221 lb. soya bean cake, Lot No. 2 an equal amount of linseed cake. The 221 lb. soya bean cake cost 13s. 10d., as compared with 19s. for the 221 lb. linseed cake. It is evident, therefore, that the extra increase of 29 lb. produced by the linseed cake was obtained by an expenditure of 5s. 2d. The sheep were sold by auction on 14th March, and averaged 5d. per lb. live weight. The 20-lb. increase was therefore worth 12s. 1d. As it was obtained at a cost of 5s. 2d., the net gain in favour of the linseed cake was 6s. 11d. As the sheep in this lot handled rather better than those fed on soya bean cake, the difference in favour of the linseed cake was somewhat greater than is shown by the figures. The experiment shows, however, that the soya bean cake is a good feeding stuff, and as its manurial value is higher than that of linseed cake, the prices paid for the two most probably represent fairly accurately their relative values.—*Cedara Memoirs*, Vol. II.

Waterproofing.

To waterproof cloth take equal parts of alum, soap, and isinglass; sufficient water. Mode: Dissolve each of the ingredients separately in sufficient water to make a tolerably strong solution. Then mix altogether and with a sponge thoroughly imbue the cloth on the wrong side. After this dry the cloth and then brush it well. first with a dry brush and afterwards with a brush dipped lightly in a little water.

To waterproof woollen cloth make after the following manner two solutions in two separate vessels. First, dissolve 1 lb. of sugar lead in 1 gallon of water. Second, dissolve 1 lb. of alum in 1 gallon of water. Dip the cloth to be made waterproof first in the solution of lead, and, when nearly dry, dip in the solution of alum; then dry it in the air or before the fire. This process is very effectual, and it may be used for coats and other garments even after made up. To restore a waterproof coat dissolve a handful of best grey lime in half a pail of water and with this solution wipe the coat at the hardened parts. This should be done twice at intervals of about four hours. After this treatment a hardened waterproof laid by as useless for years should be equal to new.

To render calico waterproof a coating of boiled linseed oil containing a little turpentine is a good plan. Another is the alumina soap method. This consists in passing the calico first through a warm soap bath (1 lb. to the gallon), then through an alum bath of the same strength, followed by passing the stuff through the mangle. There will be no appearance of any coating as the alumina soap is in the fibre itself. This metallic soap is excellent for the purpose.

To waterproof canvas the following is recommended: Into 1 gallon of rain-water stir 1 oz. of sugar of lead and 1 oz. of powdered alum until they are quite dissolved. Let the solution stand till the sediment falls. Then pour off the water and lay the sheet in it for twenty-four hours. This liquid will also render ordinary cloth rainproof. If an oil sheet is no longer rainproof, give it a good coating of a dubbing made by melting one part of mutton suet and two parts of beeswax. When these are thoroughly mixed apply with a piece of rag.

Black waterproof dressing for wagon or stack covers: Take 1 cwt. of best black paint (in paste), 3 lb. of powdered litharge, ½ gallon of thick boiled oil, ¼ gallon of hard oak varnish, and 1 lb. of sugar of lead. Thoroughly mix and thin down to proper consistency with boiled linseed oil. The above dries quickly with a bright surface and does not crack or blister when exposed to the weather.—*The Queensland Agricultural Journal.*

Coffee.

In reply to an inquiry on this subject Mr. E. R. Sawer, Director of Agriculture (Natal), supplied the following memorandum:—

Climate Required.—Coffee does not flourish in climates where temperature falls at any time below 55°. Best coffee grown between 2500 and 5000 feet. Arabian coffee does not do well under 1500 feet; Liberian coffee on the other hand does best between sea level and 1500 feet. Arabian coffee has been almost exterminated at lower level by the leaf blight (*Hemileia vastatrix*) and insect pests (white fly), especially in Dominica, Ceylon, and Natal. Coffee will not tolerate a continuously wet climate or exposed position. It requires a dry season in which to mature wood and moist weather to ripen fruit. Shelter belts of such trees as albizzia are almost always employed.

Soils.—Coffee plants show a well developed tap root and require deep, good soils. Cleared forest land rich in humus is to be preferred.

Broken stone in the soil is not objectionable if disintegrated to a considerable depth.

Varieties.—1. *Coffee arabica*: Wild in Abyssinia, Angola, and the neighbourhood of Victoria Nyanza; said also to occur spontaneously in Madagascar, Mozambique, and Natal. In numerous cultivated varieties is the source of most of the coffee of commerce. This type is still being grown on a small scale at Ifafa and Imbazana in Natal.

2. *Coffee liberica*: Inhabits Sierra Leone and Angola.

3. *Coffee stenophylla*: Is the highland coffee of Sierra Leone.

4. *Coffee zanguebarica*: Found in Zanzibar, Mozambique, and possibly Natal. This is being cultivated at our Winkle Spruit Station as a possible stock upon which to graft Arabian scions.

Propagation.—Coffee plants are propagated by seed and the seedlings may either be raised in seed beds or collected from under mature plants. Numbers of young plants grow up under the trees on coffee plantation. Bamboo-pots are very suitable for artificial propagation. Saw through canes an inch below each node. Pierce the node with a large hole for drainage and put some small stones in bottom; then a little moss or rotten leaves. Fill up with earth to within an inch from the top and knock the pot down several times to settle soil. The single seed, fresh from the pulp, should then be placed in the pot and covered with soil.

Planting.—After timber and scrub has been cleared off ground and rubbish burnt, line out the ground and dig holes 2 feet square by 2 deep, with a spacing 6 feet × 6 feet. Leave open for a few weeks and when planting do not put back earth taken from hole but draw in surface soil together with weeds or kraal manure. Sinking of the holes will later occur, and the depression should be filled in. Plant at commencement of rainy season, using twelve-month transplants. Split the bamboo pots on both sides with cane knife. Temporary shade should be provided by placing cut branches over transplants until well established.

Shade for Mature Trees.—If Arabian coffee be planted at a low level shade is necessary. *Eugenia jambos* (rose apple), *Albizzia molucanna*, and the silver oak (*Grevillea robusta*) are suitable shade trees. These should be planted as a single row at intervals of 50 feet through the coffee plantations. If the coffee shows signs of becoming "leggy" the shade may be lightened by lopping back overhanging branches.

Topping.—Coffee may grow to a height of 40 ft. if unstopped, and bears most of its seed near the top. Cut the trees back after they have attained a height at which all berries can be picked without difficulty. Never allow to grow more than 5 feet.

Pruning.—If trees are allowed to go unchecked they become a mass of tangled branches.

Handling.—A "handling" should be given just after the flowers appear. All superfluous leaf buds ("flush") are removed to increase flow of sap to the berries. During a second "handling" suckers and cross-wise shoots are rubbed off without injuring the bark. Autumn shoots should be left, and after harvesting all shoots that have borne fruit are removed.

Harvesting.—The ripe fruit is called the "cherry"; the twin seeds are the "berries". The succulent outer coat of the fruit is the

"pulp" and the inner, thin adhesive layer the "parchment". Coffee is preferably shipped in the parchment.

Picking.—The crop is ready for picking as soon as the cherries show a pink tinge. The berry inside will then be found to be of a fine, bluish-green colour. Planters endeavour to preserve this tint as far as possible. Berries that have dried to a reddish colour are spoken of as "foxy" and have a lower value.

Pulping.—Several machines are available for removing the pulp, of which the disc-pulper is the simplest, and may be worked either by hand or power. In design and action it resembles a cotton gin.

Fermentation and Washing.—After the berries have passed through the pulper they are found covered with a sticky mucilaginous substance. This is removed by washing and fermentation. The berries are placed in bulk in boxes or bins for twelve or fourteen hours during which fermentation ensues. They are then thoroughly washed and spread out to dry on specially prepared platforms.

Hulling, or the removal of the parchment, is generally performed by the traders and not by the planters.

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

RUBBER TREE SEED.

To the EDITOR of the *Agricultural Journal.*

SIR,—Having obtained a small quantity of rubber tree seed from Ceylon for experimental planting, and, by mistake, rather more having been sent me than I require, I am willing to distribute the surplus to any fellow-farmers wishing to try some who apply sharp and enclose postage stamps for a couple of shillings to defray cost, etc.

The seed is from two of the best-known varieties of rubber tree grown in Ceylon, viz., "Para" and "Ceara". As stated, only a limited number of seeds is available.—Yours, etc.,

W. C. GOULD.

P.O. Kenkelbosch, via Barkly Bridge (Cape),
18th December, 1911.

THE EXPORTATION OF ANGORAS AND OSTRICHES.

To the EDITOR of the *Agricultural Journal.*

SIR,—I should be obliged if you would publish this letter in your journal as I think that it is a subject worthy of consideration by South African farmers.

The subject I wish to write about is "The Exportation of Angora Goats and Ostriches from South Africa". As regards the Angora goat, I am of the opinion that South Africa is taking up a very narrow policy in not allowing the Angora goat to be exported from her shores, as mohair is a commercial product of necessity and I understand is being used for more purposes each year, therefore the production ought rather to be encouraged than retarded. However, whether this is the case or not, I should like to point out that South Africa is not the only market for pure-bred Angora goats, and by closing her market as she is doing at present she is forcing young countries like British East Africa to get their goats from either Turkey or Australia. Surely by so doing she is cutting her own throat?

I may say that recently when travelling through the Eastern Province of the Cape Colony I happened to mention that British East Africa was importing Angora goats from Australia, whereupon one of the leading Angora goat farmers of the Colony asked me indignantly why we did not support the South African Angora breeder and get goats from South Africa instead of sending to other countries for them! Enough with regard to goats, except that I maintain that it is a crying shame that a British Colony in Africa has to import her stock from other countries on account of her sister Colony in the same continent closing her doors.

I should now like to touch on the question of the export of ostriches from South Africa. Here we are dealing with a bird which produces an article of luxury and not of necessity, therefore there is something to be said in favour of the attitude South Africa has taken up in this particular instance, yet there are a great many ostrich farmers in favour of opening the South

African ostrich market to all countries, but these men again have a strong opposition party in favour of total prohibition from export from the Union of South Africa. Whether or not it is wise to throw open the ostrich market to the world I leave for those more able than myself to express an opinion; but what makes us, farming in British East Africa, annoyed, and I say rightly annoyed, is that British South Africa allows German West Africa to import her ostriches and yet will not allow her neighbouring British Colony to do so. Surely there is something wrong somewhere?

You may say that in allowing German West Africa to import your ostriches she does so overland, while if you allowed British East Africa to import your ostriches she (British East Africa) would have to take the ostriches by sea and therefore you would have no hold on the birds when once they had left your shores. There is perhaps something in this, but I maintain that it could be overcome, and suggest the following means of doing so:—

That it be stipulated that any ostriches leaving South Africa by sea for East Africa must before embarkation on board ship have a permit produced by the shipper, this permit to be from the British East African Government, and should state the number of birds being shipped, the port of disembarkation, etc., and also it should state by whom the birds were being imported, and that they were imported for breeding purposes in East Africa only and not for exportation to other countries. This permit could, I take it, be signed by the Governor of East Africa, which would be a guarantee that the birds imported were for genuine breeding purposes only.

As regards ostriches being smuggled out of East Africa, I contend that although ostriches could be smuggled out of any country in the world, yet East Africa is very favourably situated to prevent smuggling owing to our comparatively short coast-line.

You may again say—Why should British East Africa have our Cape ostriches, as we will be giving them something they want and get nothing in return? I would like to point out that although we would be getting what we want from you by paying for it, i.e. quality and breadth in feather, yet on the other hand you would by importing our birds get qualities which I maintain you would not object to have: these are:—

1. Strong stiff round quill.
2. Dark femina feather. (The East African hen ostrich has a very dark coloured feather resembling your drab, which colour I understand is liked by the market.)
3. A strong self-supporting flue.
4. Last, but not least, the East African ostrich is a much larger bird than your South African ostrich, and although you may laugh and say that we grow ostriches for meat and not feather production, yet I say that size means constitution, and constitution is what, I maintain, you will want in your birds more and more as years go on.

I have written this letter as I think that this question of the export of Angora goats and ostriches from South Africa is one worthy of more attention than it is getting from the South African farmer to-day.

I would like to suggest that this subject be brought up at the various farmers' meetings held during the agricultural shows this season, as I understand these meetings are invariably held at all the show centres, and if this subject could be discussed at these meetings then the true feeling of the farmers could be arrived at on this subject, which to my mind is an important one.—Yours, etc.,

N. J. M. BARRY.

Naivasha, British East Africa.

SCAB ACT ADMINISTRATION.

To the EDITOR of the *Agricultural Journal.*

SIR.—Your November issue contains a letter from Mr. C. Clements asking farmers to give their views on the above subject.

I cannot agree with Mr. Clements *re* inspectors being authorized to visit each farm monthly, as in the first place the wards being so large no inspector could visit each farm monthly, and in the second he would be doing unnecessary work, visiting farms that are clean, whereas his time might be much more profitably occupied in looking after that section of the farming community that either can't or won't cleanse its sheep and farms.

Every farmer who is anxious to free his stock of scab takes necessary steps, and the inspector's visit and orders to such a man are merely a matter of form. But then there are farmers who hide an outbreak and put off reporting as long as possible. Every inspector gets to know every man in his ward, and he knows whom he can rely on to report and whom he can not. By not visiting every farm in his ward monthly he has a better opportunity of dealing with and eradicating scab where necessary. After all it takes very little time and trouble to write a report, and saves an inspector unnecessary work and trouble.—Yours, etc.,

W. T. Elliott.

Naauwpoort, 24th November.

TREE LUCERNE (*MEDICAGO ARBOREA*).

To the Editor of the *Agricultural Journal.*

Sir,—With reference to a reply by the Government Botanist to a query from Mr. C. S. Erasmus, with reference to the above plant, it may interest some of your readers to know that from seed obtained from New Zealand I have grown trees to a height of 6 feet in eighteen months. The foliage is pretty and green throughout the year—some of the leaves, however, become yellow and fall during August—but so far as its feeding value is concerned my cows will not look at it. It has a highly scented small white flower.—Yours, etc.,

C. Harvey

Potchefstroom, 5th December.

SPRING-HARES AND ROOKS.

To the Editor of the *Agricultural Journal.*

Sir,—In your November issue I note the letter from Mr. F. J. Blanckenburg, Gerhardminnebron, Frederikstad, Orange Free State, *re* spring-hare destruction We are not troubled in these parts as far as I know with this pest, but what we are troubled with are those wretched black rooks, or crows. They simply dig my mealies up wholesale as they pop out of the ground. I tried shooting, and several small boys in the lands, but while you may be successful after sunrise you will find these wretches have paid you a visit before sunrise or just after daybreak, and with about 100 acres of mealies it is impossible to keep them on the wing.

I tried with great success arsenic at 1s. 6d. per lb., which is specially stocked for bird killing by the chemists. I half fill an ordinary paraffin tin with mealies and boil them well until they burst open, and then add ½ lb. arsenic to a tin of mealies and stir well, until all the arsenic is absorbed, then sow on the land with good results. I thought possibly spring-hares may be temped the same way.—Yours, etc ,

Ben Norton

Berlin, C.P.

TO RID THE LAND OF SPRING-HARES

To the Editor of the *Agricultural Journal.*

Sir,—Mr. F. J. Blanckenburg wants to know of a good plan to rid his lands of spring-hares. Here is a simple plan. Take some cobs of green mealies, or mealies which had ripened, and parboil them Break the cobs up into three or four pieces. Slit down a row of the mealies, cutting fairly deep into them. Widen out the slit slightly, take a small quantity of arsenic, fill the cut, and squeeze together to prevent the arsenic from dropping out Lay the poisoned bait around the haunts of these troublesome little animals and he will be surprised at the result.—Yours, etc.,

J. J. Keeley.

Mosita, 29th November, 1911.

To the Editor of the *Agricultural Journal.*

Sir,—With reference to Mr. Blanckenburg's letter in your November issue and your note. Having had experience in the poisoning of similar vermin

over a wide area elsewhere and having suffered from the nuisance he refers to in this country also when I was growing maize on a small piece of ground near the Doornfontein School in this district, I may say that if shooting at night with a lantern is impracticable Mr. Blanckenburg should try scattering small cakes of pollard or some attractive meal, the size of a cubic centimetre, in which some yellow phosphorus dissolved in carbon bisulphide has been mixed. I have seen 500 rabbits that had been poisoned by this means skinned on one rabbit warren in an afternoon. The skins fetched 3d. each, and my experience with spring-hares was that although no dead ones were found—I made the dough somewhat too wet—no further destruction of maize plants occurred, perhaps owing to their being scared by the glow of the phosphorized cakes in the dark.

How would Mr. Blanckenburg dissolve the arsenic that he proposes to boil the maize (mealies) in?

In this uninhabited region, lying between Zeerust and Lichtenburg, I am also ploughing and sowing mealies, but there appear to be no spring-hares, fortunately. It may, however, interest you to hear that the other day I startled a pack of wild honden (black hunting dogs), which sprang up one after the other in the veld at a distance of about 1500 yards. The number appeared to be about twenty or thirty, and there appeared to be young ones amongst them.—Yours, etc.,

J. VON S. WANSBROUGH.

Holpan, Marico, 1st December.

To the EDITOR of the *Agricultural Journal*.

SIR,—In your issue of this month I see a letter from Mr. Blanckenburg asking for a remedy against spring-hares, which dig up the young mealies, and I will gladly give him my experience. Arsenic cooked with mealies is quite efficient, but the poisoned mealies must be deposited before the young mealies come up, and as the spring-hares are very cautious animals they will prefer to dig up the mealies and leave the poisoned mealies alone.

I have found another remedy, which I applied three years since with such success that I got rid entirely of this pest.

As soon as the young plants make their appearance I go every day to the lands in order to ascertain when the spring-hares dig up the plants, and as soon as I see that they have started digging up the plants I at once harrow the lands, but the harrowing should not be done before the spring-hares have started digging up the mealies. As soon as they discover that the soil has been tampered with they will come no more to that land.

As I have had great success with this plan I consider it to be useful for my fellow-farmers. I should add that it is only necessary to harrow the land once.—Yours, etc.,

N. A. OBERHOLZER.

Marseilles, Orange Free State, 23rd November.

To the EDITOR of the *Agricultural Journal*.

SIR,—In answer to a question by Mr. F. G. Blanckenburg *re* the destruction of spring-hares, I can inform him that I have used wolf poison with considerable success. I dissolve this poison, as much as goes on the point of a knife, and a big spoonful of sugar in boiling water. I then mix this with a big cup of maize grit and distribute quantities of it in the lands.—Yours, etc.,

W. L. DE WILDE.

Heidelberg, 4th December, 1911.

SCAB AND JACKALS.

To the EDITOR of the *Agricultural Journal*.

SIR,—I don't know if it will serve any purpose to write in the *Agricultural Journal* on the above question, because I think all farmers who read the *Agricultural Journal* do know that scab can be eradicated by willing hands. But if there are still any farmers—I know there are a good many, but I mean of those who receive the *Agricultural Journal*—who believe that scab cannot be

eradicated, then I am willing to give my experience also. To be short, I fought scab from the first moment that the Scab Act was enforced; the inspector told me that scab was brought about by a louse, and I answered I did not believe it. I started dipping, however, as my stock were under order. I dipped twice, and I must say it all took place in a hurry, and after forty days I had scab again. This state of affairs lasted a couple of years, then I decided to make sure if scab is caused by an insect. One morning, it was a very cold morning, I went to my kraal and I caught a young sheep with big scab spots and at once I detected with the naked eye some insects. I was farming with Africander sheep and Angora goats. Since then I dipped better, but I was never without scab, because when my stock were nearly clean I brought the scab on to the farm again through buying fresh stock, and my stock were always sent back, after dipping, to the same kraal. This lasted till 1900, when I at last did good work. My dip material consisted of lime and sulphur; before I used Cooper's dip. Now, after having dipped properly and after having built another kraal my flocks were clean. This happened in March, 1901. But I was not at the end of my troubles. I was careful; I bought no more stock that could infect mine. All seemed right, the future looked promising, I need no more be ashamed of strangers seeing my scab-sick flocks. In September, 1901, I brought in my Angora ewes to lamb in my barn. It is true that infected stock had been in the barn now and then, and I thought there was no more danger. Everything went well; when I sheared the young goats in April, 1902, they were all clean, but in June four had scab. I spoke to the inspector and he said it was scab. I denied this. Afterwards I treated them in the same way with the same result. A year later I built a new kraal and the scab disappeared until this day. I must say I have not burned the kraal. I still get some manure from it, but a louse cannot attach itself to a passing sheep.

Now, Mr. Editor, people speak about the eradication of jackals, but let us eradicate scab first.

It is much more easy to destroy the tame scab louse than this cunning "Vossie" that cannot be destroyed if we were to spend millions of pounds, as has been proved in the last fifteen years.—Yours, etc.,

M. van Rooyen.

Annandale, Cape Province, 16th November, 1911.

EARTHEN FLOORS AND OIL.

To the Editor of the *Agricultural Journal.*

Sir,—In your December issue Mr. T. C. P. Maynard asks how to make an earth floor with oil. I have experimented a lot and find that the best method is with boiled linseed oil. Make the floor of earth that will set hard (pot-clay is best) and then apply the oil with a cheap whitewash brush. Three gallons of oil will do a floor 12 feet by 12 feet. The floor when properly dry can be washed with soap and water, and if a little oil is occasionally applied the floor is everlasting, providing the foundation is good. For farm use this floor is preferable to boards, as ants will not work into it.—Yours, etc.,

W. H. Sargent.

P.S.—Tar and raw linseed oil are useless.

Battlemount, 22nd December, 1911.

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal*. In all cases replies will be posted to correspondents so soon as same have been procured.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

WINTER GRASSES FOR EAST GRIQUALAND.

"Pastoral" writes from Ugie, East Griqualand :—It is my intention to plant some artificial grasses for winter feed, and I wish to know what varieties the Department recommends. My climate and soil conditions are as follows :—Rainfall, about 30 inches, extending from about October to April; climate very cool, with very many misty and overcast days. Soil light and inclined to be sandy and rather poor in quality. Winter severe, but not very long. Heavy frosts during June and July. Natural grasses available about 15th August. It is therefore for the months of June and July that I wish to supply the artificial grasses. I want a variety that will keep green during these months. I wish to lay down, first as an experiment, say, two or three acres each. I can then judge for myself how they will stand the winter.

Answer.—The Acting Government Agriculturist (Cape) replied :—The grasses which have up to the present shown in the greatest degree the required qualities are Tall Fescue, Cocksfoot, and Phalaris Bulbosa, and a trial of these three on the scale indicated by correspondent is recommended. They may be sown about February.

GRAZING CALVES.

H. T. K., Wakkerstroom, asks :—How old do you think calves, drinking from their mothers, should be before they are let out for grazing, and is it too long to keep them till they are six to eight months without grazing ?

Answer.—The General Manager, Experiment Farm, Potchefstroom, replied :—The practice varies a good deal. Some breeders prefer to keep their calves kraaled until they are four to six months old, or only allow them to run around about the homestead ; others prefer to let the calves run with their dams. During spring and summer I prefer to allow calves which are suckling their mothers to run all day and night with their dams, especially if some shelter is available in the paddocks. In my opinion there is considerable risk of calves being infected with tape worms around some homesteads. A little succulent green grass does no harm to young calves, but calves under four or five months old should not be allowed to have coarse dry fodder.

TREATMENT FOR GREASY HEEL.

S. T. Marais, (B.'s son), Sleutelpoortje, P.O. Welgevonden, via Kleinpoort, District Uitenhage, Cape Province, asks for advice as to treatment for greasy heel.

Answer.—The Veterinary Division replied :—Greezy heels are frequently seen in horses and are rather a troublesome affection to treat satisfactorily. I would suggest you wash the sore part out once a day with a little warm water and soap, then dry off thoroughly and after each washing shake over the sore part a little of a powder composed of two ounces each of iodoform and boracic acid, then place over the sores some cotton wool and keep the whole in position with a bandage. You should be able to get a chemist to make up the powder for you and he will also be able to supply you with the cotton wool and bandages. See that your stable is kept scrupulously clean and that no dirt can get into the horse's heels. An ounce of epsom salts once or twice a week in his drinking water or in a mash of crushed mealies, bran, oats, etc., would also be indicated. Green food such as lucerne or barley will do no harm.

SNOTZIEKTE.

C. J. Myburgh, Ou Roodepoort, P.O. Paradijs, Kroonstad East, writes :—On a neighbouring farm a cow died, and several farmers who have lived here some considerable time said that it was caused by a disease known amongst the voortrekkers as "snotziekte". On inquiring about it I was told that it was very prevalent formerly when there were wildebeest about, but only isolated cases occur now. The symptoms were as follows :—A bad running from the nose and eyes, the latter appearing swollen, but really sinking away. The third day the animal became totally blind and refused to feed. Later on she became altogether stiff in the forequarters and died after the twelfth day. A post-mortem showed the liver to be an enormous size and appearing on the point of putrefaction; gall slightly enlarged; heart large and arteries filled with lumps of clotted blood. Outwardly the lungs appeared all right, but on being cut open the tubes were filled with a soft, foamy matter. Stomach and kidneys normal. The brain appeared as if decomposed. Could the Department enlighten me as to the cause of death and the disease generally? Is it called "snotziekte"; if not, what is "snotziekte"? Is there a remedy for it? I have been told there is not.

Answer.—The Veterinary Division replied as follows :—The term "snotziekte" is applied by the average farmer to any disease of animals in which there is a pronounced mucous discharge from the nostrils, such as is seen in glanders, strangles, influenza, inflammation of the lungs or a severe cold in equines, or in cattle suffering from tuberculosis, ordinary cold, or the presence of some foreign body such as a nail, piece of wire, or pin in their lungs. It is not thought that the case referred to by correspondent was of a contagious nature; possibly it was due to some foreign body, such as a nail, piece of wire, etc., in one of the internal organs of the cow; at least the condition of the liver, heart, lungs, and arteries as described would point to that being so. From the above it will be gathered that the term snotziekte does not describe any particular or specific disease; it is a term applied when excessive mucous discharge is observed to run from the nose, such discharge being seen in different diseases, in different species of animals, and is due to many different causes.

PLANTING ORANGE TREES.

S. Grové, Prieska, Cape Province, asks :—(1) How far apart should orange trees (seedlings) be planted? (2) Would these trees do well in limey soil when holes are made and filled with good earth? (3) What is the best time for planting out from the tins? (4) Do the young trees require much water? (5) What is the best means of protecting against frost?

Answer.—The Government Horticulturist (Transvaal) replied :—(1) Seedling orange trees should not be planted at all if it is desired to make money out of oranges. If you feel you *must* plant them, set them out not less than 30 feet apart. (2) It is difficult to say whether oranges will grow in your limey soil. The best plan would be to forward a sample of the soil for analysis to the Chief Chemist, Department of Agriculture, Pretoria. In any case you do not need to make deep holes; about 2 feet is as deep as you need go, and they should be about 3 feet wide. (3) The best time for transplanting out of tins will be in December or January, and not later than the end of January. (4) The young trees will require to be well watered after planting. After giving them water, dig or hoe round the trees and keep the soil nice and loose; by doing this it will not be necessary to water them so frequently. Do not give them much water after the end of March, or sappy growths will be encouraged which will probably be cut off by the winter frosts. (5) The best way to protect the trees from frost is to cover them with long grass, which should not go quite down to the ground on account of allowing the trees to have air, and you can also scatter dried straw or litter of some kind or even draw the soil up around the stem of the trees six or eight inches above the normal height, but it must be thrown back again in the spring of the year.

BUTTER-MAKING.

J. R. Gavin, Private Bag, Cypress Grove Siding, Midland Line, asks :—(1) What temperature should cream be before churning in summer months? (2) How long will cream take to ripen in summer months and winter?

Answer.—The Superintendent of Dairying replied :—(1) Cream for churning in summer should be reduced to 60° F. if possible. A lower temperature would be better, say 54° to 56° F., but these temperatures would be difficult to obtain without the aid of ice. (2) Cream kept at temperatures of 60° F. for 36 hours is usally ripe enough for churning. In winter, cream can be kept for three or four days, and it is sometimes necessary to raise the temperature up to 70° F. the evening before churning to facilitate the ripening process.

INCUBATING OSTRICH EGGS.

F. E. O. Mörs, De Kroon, P.O. Brits, Transvaal, states that he placed a number of ostrich eggs in his incubator, and that everything went well until the last day, when all the chicks died in the eggs. He adds that, on that day, a threshing machine was working in the vicinity of the incubator, and he thinks that the chicks died either from shock through the noise of this machine, or through the temperature of the incubator not being correct. He accordingly asks :—(1) What heat is necessary to hatch out ostrich eggs? (2) How many degrees Fahrenheit must the eggs have on the last day?

Answer.—The Farm Manager of the Experiment Farm, Middelburg (Cape), replied :—I have always been very successful with all the incubators (of various kinds) that I have used by running the machine at 98° F. right through the hatch, except the first two or three days, when I start at 96° F. and work up to 98° by the third day. The bulb of the thermometer should be on a level with the tops of the eggs. Do not allow the machine to run above 98° on the last day—it might be better to reduce to 97° although this is not absolutely necessary. I do not think the noise of the thresher could have done all the harm; it would depend on how close it was to the incubator room. If the incubator has no moisture device, damp the eggs thoroughly every morning for the last fourteen days of the hatch with water at 100° F. Mark the air space end of the eggs and keep them tilted with the air space ends slightly up, right through the hatch.

KAFFIR CORN APHIS.

W. C. Guiney, Kliprand, P.O. Zastron, Orange Free State, writes that his Kaffir corn and mealie crops have been eaten down by lice, both in old and new lands, and asks for advice as to cause and treatment.

Answer.—The Acting Chief of the Division of Entomology replied :—The insect is probably the Kaffir Corn Aphis (*Aphis sorgi*), concerning which paragraphs have occasionally appeared in the Natal and Cape *Agricultural Journals* since about 1903. In the year mentioned it was very troublesome over a large area in Zululand, and since then it has commonly given trouble in Pondoland and south-eastern districts of the Cape Province as well as in Natal. It gives far more trouble in some years than in others, as is usual with aphides, and it is reasonable to assume that its variations in prevalence from season to season are chiefly due to the climatic conditions of some seasons being far less favourable than those of other seasons to its rather numerous enemies, particularly internal parasites and a fungous disease.

GREEN CATERPILLAR IN LUCERNE.

Geo. Green, Falconhurst, P.O. Coalbrook, Orange Free State, writes :—I have four acres under lucerne and am putting more down next year. I notice hundreds of copper-coloured butterflies in and out amongst the lucerne and discovered that they lay a green caterpillar, which does a lot of damage. I have had to cut the lucerne down. Is there any other remedy besides this?

Answer.—The Chief Entomologist replied :—The green caterpillars are the progeny of the yellow to copper coloured butterflies as surmised. No better measure to save the lucerne than that of harvesting or feeding it off when the caterpillars threaten to consume it nearly as fast as it develops is known to me.

PIPE CALABASH.

H. Kussell, Rockdale, P.O. Sapkamma Siding, Cape Province, asks :—(1) Where are pipe calabashes obtainable? (2) Has the Government any control over the export trade?

Answer.—The Acting Government Agriculturist (Cape) replied :—(1) The districts in which calabashes are largely grown are Roberston, Montague, and Worcester. For the names and addresses of growers correspondent is referred to the secretary of the Robertson and Montague Agricultural Society. (2) The Department has up to the present not been connected in any way with the commercial aspect of calabash growing or selling; and the Government has no control over the export trade in calabash bowls. The gourds are grown as follows :—The seed should be planted like pumpkin pips, i.e. in rows five yards apart each way, but in poorish land, so as not to have the gourds too large. The shape of the gourds can be improved by turning them into the correct position—that is, turning the point of the gourd towards the vine. The calabashes should be picked when they

change colour from green to white, and must not be allowed to reach the yellow stage, as they are then over-ripe. After cutting the pipes from the calabashes they are boiled for two hours, and during this process they are occasionally stirred. When removed warm from the pot the bark is scraped off with a blunt knife and the pipe is then cut to the exact size required for mounting. The pipes are then laid out in the sun and should be perfectly dry before being stored.

BEES—SWARMING AND BROOD QUERIES.

W. S. Turner, Keimoes, Gordonia, asks :—What should be done to keep bees in their hives, and also that they may produce honey and not young bees.

Answer.—Mr. H. L. Attridge replied :—Mr. Turner does not state if he keeps bees in the old-fashioned domicile, which may be a barrel, or box of any pattern and dimensions, or in a bar-frame hive. If of the former type, I would advise transferring the bees to a modern bar-frame hive, which will give him complete control of the colony. Any straight and even combs might be transferred with the bees and would be some security against absconding. As a further guarantee a piece of queen excluder zinc should be placed over the entrance of new hive for a few days till the colony has well settled down to work. I infer from his letter that he is possibly troubled by his bees' excessive swarming habits and rapid increase of brood. The production of young bees in large numbers is evidence of the prolificness of the queen and general prosperity of the colony. In modern practice a huge population is of great value, increasing the profits in proportion. Should it be thought desirable, the queen may be restricted to the use of a limited number of frames for breeding purposes by the use of queen excluder zinc. Ten frames would be a suitable number, additional frames and supers being added to receive surplus honey. For further information I would suggest the study of a bee-book.

London Wool Market.

SOUTH AFRICAN WOOL IN 1911.

In their Annual Colonial Wool Report for 1911, Messrs. Buxton, Ronald & Co. state with regard to South African wools :—

South Africa.—45,103 bales were offered on this market during the past twelve months as against 40,960 bales for the preceding year, thus showing a satisfactory increase, and, moreover, as the increase is accounted for practically entirely by the clips sent here on growers' account, there seems good reason for believing that this market has by results proved itself acceptable.

It is of course common knowledge that great efforts have been made to improve the type of South African sheep and the general get up of the wool ; and these efforts have been attended with conspicuous success. It had become increasingly evident, however, that for the fullest benefits to be reaped by these progressive sheep-men some very different methods of marketing the wool to those previously obtaining would have to be resorted to ; and so it has come about that the old order of things, whereby all clips, good, bad, and indifferent, were sold up country to local storekeepers at one and the same price, has gradually given place to public auctions at different centres, and clips are now sold individually with some regard to respective merits. However distasteful this innovation may be to those who, with scabby or very wasty wool, benefited so largely under the old system, it is certain that the innovation has come to stay. As a consequence South African wools are known to-day to a larger circle of buyers than has ever been the case before, and it is safe to predict that with a continuance of this improvement in the marketing and in the clips themselves, South African wools will attain to a still higher position in wool-using centres. To this position they are now justly entitled, bearing in mind the large sums which have been spent in the introduction of well-proved Australian blood, and the intelligence which has been brought to bear on the whole question by both growers and Government alike.

Taking the clip over all it was not so good as its predecessor. The Western Province clips showed up in fair condition without being anything out of the common. As we have remarked on previous occasions, more length is wanted in these Western clips. Perhaps from climatic causes it is not possible to produce a longer staple, but there is no sort of doubt but that if it could be attained, growers would be speedily repaid in £. s. d. The Bedford and Adelaide clips were well to the front again, showing real excellence in the classing and skirting. Many of the clips, however, showed traces of a none too generous season, and prices were regulated accordingly. Kaffrarian clips as usual were a mixed lot. The best were very good, showing excellent breeding with heavy cutting fleeces. Queenstown district clips were a good deal heavier than last time, and in nearly all cases tender. Further north in Cape Colony the season had left its traces in the form of tender staple and short growth, and in the Orange Free State practically the whole of the wool was affected in the same manner, and presented a very different style to the sound bold wool of 1910. Over these natural conditions there is of course no control, but it was pleasing to note that the indifferent material had been in many cases put before buyers in absolutely irreproachable style, and all credit is due to those Associations, such as Dewetsdorp, Smithfield, and Bethlehem, to mention only a few, and to the growers in the Winburg district and elsewhere who have done so much in this direction. The supplies from Natal proper were relatively very small. Transvaal wools were not always easy to identify, but the few that were capable of identification showed mostly a tendency to weakness of growth. We have to record a great improvement in the classing of several of these Transvaal lots, and the work of the Government classers was in every way satisfactory. A few of the leading marks and prices are given herewith, and the list might very easily have been further extended but for the seeming reluctance on the part of growers to fully brand their bales. In many cases initials are merely used, but surely a well-bred, carefully prepared clip is worthy of something more than mere initials, and under some more definite brand, such as the name of the farm or name of the owner, would be readily identified by buyers on future occasions.

ORANGE FREE STATE.

	d.		d.
F. A. S. Schimper	11	Brown Bros. Daggafontein	10½
CB Retreat	11	JWVZ	10½
Jay & Walton Beddington Farm	10½	HH	10½
C. E. Jay	10½	JHVR	10½
R. Charlton Winburg	10½	PL	10½
G. McKechnie Wildebeestfontein Brandfort	10½	JMVN	10½
		IMVR	10½

WESTERN CAPE.

	d.		d.
CS MB	11½	CL Gloria	11
DL...	11½		

KAFFRARIAN.

	d.
WAR	12
J. Arnold Northcliffe	11

	d.
RB C (in diamond)	11

BEDFORD AND ADELAIDE DISTRICT, ETC.

	d.		d.
A. Luckhoff	11½	M. J. Kemp Uplands	10½
J. P. Bennett Austrey	11	D. Pringle Adelaide	10
Pringle Bros. Glen Thorn	11	Hockly & Son Bedford	10
W. B. Pohl Orchard	10½	F. W. Southey Hillmoor	9½
E. J. Niland Mt. Pleasant	10½		

The following are the prices ruling for South African wools during the year. Snow-whites were an excellent market for a while, but latterly have suffered in common with all wools of short staple.

Series.	Western Cape.			Algoa Bay.		
	Grease.	Scoured.	Fleece.	Grease.	Scoured.	Fleece.
	d.	d.	d.	d.	d.	
November, 1910 ...	10½—11½	21½—22½	11½—12½	9½—10½	20—21	—
January, 1911 ...	10—11	21—22	11—12	9—10	20½—21½	—
March " ...	10—11	22—23		9½—10½	21—22	—
May " ...	10—11	22—23	—	9½—10	20—21	—
July " ...	10—11	21½—22½	—	9—10	19½—20½	—
September " ...	10—11	21—22	—	8½—9½	19—20	—

Series.	East London.			Natal.		
	Grease.	Scoured.	Fleece.	Grease.	Scoured.	Fleece.
	d.	d.		d	d.	
November, 1910 ...	9—9½	18½—19	—	8—9	18½—19½	—
January, 1911 ...	8½—9½	17½—18½	—	7—8	18—19	—
March " ...	9—10	18—19	—	7½—8½	18½—19½	—
May " ...	9—9½	18—19	—	7½—8	18—19	
July " ...	8½—9	17½—18½	—	7—8	17—18	
September " ...	8—9	17—18	—	7—7½	16½—17½	

South African Produce Markets.

CAPETOWN.

The Produce Department of the firm of R. Müllar, Capetown, reports under date of the 22nd of December, 1911, as follows :—

Ostrich Feathers.—On the 4th instant, the London Feather Sales commenced; 109,000 ℔s. were offered. All good kinds of wing feathers were eagerly competed for. For good whites and feminas no material change in price was experienced. Inferior wings showed a decline of 7½ per cent. at an average. Byocks had a similar fall in price. Spadonas proved very strong at slightly advanced quotations. Boos kept very steady, with exception of best whites, which slightly receded. Blacks and drabs were sold at previous prices and partly 5 per cent. to 10 per cent. cheaper than at the previous sale. Floss proved strong. The Capetown market shows a sound competition, and satisfactory prices are obtainable for all classes of good feathers. I quote :—

	£	s.	d.		£	s.	d.
Primes	17	0	0	to	24	0	0
First	12	0	0	,,	16	0	0
Second whites	8	0	0	,,	11	0	0
Third whites	4	0	0	,,	7	10	0
Inferior and stalky whites	1	10	0	,,	3	0	0
Byocks and fancy	2	0	0	,,	9	0	0
Superior feminas	10	0	0	,,	14	0	0
First feminas	7	10	0	,,	10	0	0
Second feminas	4	0	0	,,	6	0	0
Third feminas	1	10	0	,,	3	10	0
Greys	1	10	0	,,	9	10	0
White boos	1	0	0	,,	3	0	0
Light boos	0	12	6	,,	2	0	0
Dark boos	0	3	0	,,	0	15	0
Inferior boos and tipless	0	1	0	,,	1	0	0

	£	s.	d.		£	s.	d.
Spadonas	0	10	0	to	2	15	0
Long blacks	3	0	0	,,	8	0	0
Medium blacks	2	0	0	,,	3	15	0
Short blacks	0	8	0	,,	1	5	0
Long floss black	1	7	6	,,	2	10	0
Medium floss black	0	12	6	,,	1	5	0
Short floss black	0	7	6	,,	0	10	0
Long drabs	2	10	0	,,	4	0	0
Medium drabs	0	10	0	,,	1	5	0
Short drabs	0	3	0	,,	0	7	6
Long floss drabs	1	7	6	,,	2	10	0
Medium floss drabs	0	12	6	,,	0	17	6
Short floss drabs	0	5	0	,,	0	8	0
Inferior long blacks and drabs	0	15	0	,,	2	15	0
Common blacks and drabs	0	1	0	,,	0	5	0

Wool.—The London Colonial Wool Sales closed on the 9th instant; 86,000 bales found buyers, of which 3500 bales were South African. The tendency was strong and competition was all that could be desired. Good demand showed itself all through for South African wools, specially for scoureds. South African snowwhite advanced by a penny and inferior by halfpenny up to penny. For light grease combings the advance amounted to halfpenny and for heavy grease the advance was a farthing. The competition proved very keen for Cape Western Province wools. The Capetown Wool Market is exceedingly strong, altogether in seller's favour, as will be seen from the following prices, viz. :—

Beaufort West	7d. to 7¾d.	Caledon	8¼d. to 8½d.
Beaufort West, bellies	5¾d. ,, 6¼d.		

Skins.—In sympathy with the London market our Capetown market for skins is very satisfactory. Exporters are eager to take up any quantities. Butchers should bestow greatest care upon preparing the skins and they should avoid bad cuts. I can only recommend that skins may always be very carefully treated under constant supervision. To-day's Capetown prices are as follows, viz. :—

Goatskins, light	13½d. per ℔.	Short wools	3½d. per ℔.
Goatskins, heavy	10½d. per ℔.	Pelts and damaged	3d. per ℔.
Angoras	7d. per ℔.	Bastards	4½d. per ℔.
Angoras, bastard	10d. per ℔.	Capes, large	3s. 4d. each.
Long wools, Caledon	5½d. per ℔.	Capes, medium	2s. 6d. each.
Long wools, grassveld	5½d. per ℔.	Capes, cut	1s. 6d. each.
Long wools, Karoo	5d. per ℔.	Small and damaged	0s. 8d. each.

PORT ELIZABETH.

Messrs. John Daverin & Co. report for the month of December as under :—

Ostrich Feathers.—The chief feature of the month's business has been the further depreciation in values, in sympathy with the decline in prices of various descriptions established at the London Sales which took place during the early part of the month. Some decline had certainly been anticipated, but that which actually took place was more serious than any one had expected, the worst feature of the drop in prices being that is was most marked on wings of common to average qualities, which suffered a decline, as we are informed by cable advices, of from 15 to 20 per cent. This description, of course, comprises the greater part of the value of all usual lots, and when we add that a corresponding fall took place on long blacks and drabs, it will be understood that the result was bound to have an adverse effect upon prices at this side.

This unfavourable news, together with the fact of the nearness of the holidays, has had the effect of restricting the amount of business done during the month, the sales probably amounting to not much more than half of last month's total. There were, however, not so many withdrawals from the market as might have been expected in the face of the reduction in values, most of the holders evidently having decided (and wisely, we think) to go with the market and sell out as much of their holdings as possible before business closed for the year. What doubtless persuaded them to take this course is the fact that a very large quantity (about £90,000 value) was withdrawn in London from the December sales. This will make an exceptionally heavy quantity available for the February auctions, which will doubtless be an important factor against any recovery in values at these sales. This, together with the fact of the continued absence of any move in the American trade, renders any improvement in the early part of the coming year a very remote contingency. As we have said, therefore, we think that those who decided to sell their holdings at the best prices obtainable, in preference to holding over for the possible chance of any advance in prices, were the wisest.

Best whites and feminas, as cables inform us, were steady at the London Sales. These descriptions (i.e. really prime whites and super feminas) are quite firm locally, in fact some lines on this week's market fetched higher prices than could have been obtained last month. Offerings of this class, however, are very limited.

Other descriptions which suffered little or none at the London Sales, and which are correspondingly firm here, are :—Short blacks, short and medium drabs, most descriptions of tails, spadonas, and all kinds of floss. This latter article is still in active demand, and prices are higher than normal.

Speaking generally, short stuff (blacks, drabs, and tails) are selling better than wings at present, and superior quality parcels are fetching comparatively better prices than the more ordinary lots.

Reviewing the course of prices for the past year, it becomes evident that, including various fluctuations in several minor lines, the general tendency has been towards a steady and gradual reduction in values all round, and, in our opinion, it is by no means certain that prices have reached their lowest. The enormous increase in the supply must be considered the main cause of the fall in values. (In the year 1905 the total value of ostrich feathers exported from this country amounted to £1,100,000, whilst in 1910 it amounted to 2¾ millions.) Thus it will be seen that the supply has doubled itself in five years, and it is very doubtful if the use of the article has increased to anything like the same extent during this period.

Of course, South Africa has practically the monopoly of the world's supply, but it must also be remembered that the demand for the article is practically dependent upon the vagaries of fashion, and it cannot therefore be classed, like wool, among the staple articles of the necessities of life. Thus, for instance, in America, feathers having gone out of fashion for the time, the demand from that country has ceased almost entirely, and as America, when trade there is normal, probably takes about a third of our supply, their defection is felt at once, and prices suffer accordingly. Even should trade in the United States recover soon, it might be some time before we felt the benefit of it here, as, notwithstanding the huge and steadily increasing population of that country, the manuturers there have such heavy stocks on hand at the present moment, it would take a considerable time before they would find it necessary to replenish them.

Besides this, there is always the possibility of our having to face a declension of the Continental trade. At the moment, trade there is good, and Paris, Antwerp, and Vienna are all large users, but should fashion decree it, the Continent might drop out of the market as America has done, and another of our principal consumers would be gone. From all reports we do not think this is likely to occur, but still the contingency should never be dismissed as impossible.

Looking at the question from all points of view, it would therefore appear that there is no warrant for expecting an improvement on the present state of affairs in the early

part of the year 1912, and that holders who refuse to accept present rates do so at the risk of having to accept possibly even lower rates eventually.

From the farmer's point of view, we believe that prices will have to go considerably lower still before intelligent ostrich farming in suitable localities will cease to be a paying proposition, but we think it possible that the time may be in sight when the farmer who goes in for common stock may find that his birds are not lucrative, and we would therefore advise all farmers to go in for *quality* rather than quantity. Well-bred birds cost no more for feeding and farming than do common ones, and there is therefore only the initial outlay to be considered, and this should soon be covered by the vastly increased return per bird that the farmer would expect for his pluckings.

On a weak and irregular market, such as we have often had recently, pluckings from common birds are often only sold with the greatest difficulty, and at very low prices, whilst, on the other hand, really good quality pluckings always command good competition even when the market generally is weak.

The following quotations represent approximate local current values of unsorted pluckings of the different classes, per lb.:—

	Whites.							*Feminas.*						
	£	s.	d.		£	s.	d.	£	s.	d.		£	s.	d.
Super pluckings	9	0	0	to	12	0	0	6	0	0	to	7	10	0
Good pluckings	6	15	0	„	8	0	0	4	15	0	„	5	15	0
Average pluckings	5	10	0	„	6	10	0	3	10	0	„	4	5	0
Poor average	4	10	0	„	5	0	0	2	10	0	„	3	5	0
Common and inferior	3	10	0	„	4	0	0	1	10	0	„	2	5	0

	Tails.					*Blacks.*					*Drabs.*				
	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s.	d.
Good to super	15	0	to	25	0	25	0	to	50	0	17	6	to	25	0
Average	7	6	„	10	0	13	0	„	16	0	9	0	„	11	0
Poor	4	0	„	6	0	10	0	„	12	6	5	0	„	7	6

	Spadonas.					*Chicks, unsorted.*
	s.	d.		s.	d.	s. s.
Super lots	30	0	to	45	0	1 to 5
Average lots	10	0	„	20	0	
Common	2	6	„	10	0	

Wool.—The month of December showed no material change, either in the demand or values of the article, as compared with the previous month; the outstanding feature being the maintenance of a high level of prices and the firm closing of the London Public Sales, which was not generally expected.

In the local market, there has been throughout the month a steady demand at full prices for all combing wools, and for clips possessing exceptional length of staple, fineness of quality, and freedom from excessive grease and earth, and of course well got up, extreme prices have been paid. Short wools, also in light condition, found ready sale at proportionately high prices.

Wools of doubtful yield, very fatty and earthy, and badly got up, or entirely unsorted, have been, and always will continue to be, neglected and difficult to sell.

Up-country buyers should set their faces against the encouragement of the production of this class of wool, which is not only a direct loss to the national wealth, but also injures the reputation of this staple grown in South Africa, and is thus a further cause of loss to the country.

Throughout the month, representatives of English manufacturers have been the most prominent and largest buyers; whilst Continental buyers confined their purchases to their own specialities, for which they paid very full prices.

The sales locally have been large during the month, the catalogue sales alone comprising an average of 5000 bales per week.

Large quantities still continue to arrive, but as a good turnover has been steadily maintained throughout the month, stocks here remain normal. The year will close with about 10,000 bales, of which we hold some 2000 bales, unsold.

So far as our advices from the other side guide us, with trade in Europe generally active and healthy, and the political horizon clearer than at any time during the year just closing, we feel justified in expressing the hope that current quotations will be maintained here, at least for some little time after the turn of the year.

Nevertheless, it is not to be lost sight of that heavy arrivals, especially from Australia, will reach the Continental and London markets in the early part of the year, and these must inevitably cause fluctuations in the market, with a possible decline of prices from the present comparatively high level.

We quote the following as current prices for:—

	d.		d.
Snowwhite extra superior	18½	to	19½
" superior	17	"	18
" good to superior	16	"	16½
" inferior faulty	13	"	15
Grease, super long, well-conditioned, grassveld grown (special clips)	9	"	10
Grease, super long, grassveld grown	7½	"	8½
Grease, super long, Karoo grown (special clips)	7½	"	8
Grease, super long, Karoo grown	6¾	"	7½
Grease, super long, mixed veld	6½	"	7¼
Grease, light, faultless, medium, grassveld grown	6	"	6½
Grease, light, faultless, medium, Karoo grown	6	"	6½
Grease, light, faultless, short, Karoo grown	5¼	"	6
Light Karoo lambs	6	"	6½

	d.		d.
Cross-bred grease	5½	to	6½
Cross-bred scoured	12	"	13½
Grease, coarse and coloured	3	"	5¼
Scoured " "	3	"	8
Basuto grease, short	5½	"	6
O.F.S. grassveld grease, long and well-conditioned (special clips)	7	"	7½
O.F.S. grassveld grease, long and well-conditioned	6	"	6¾
O.F.S. grassveld medium grown, light, with little fault	5½	"	6¼
O.F.S. grassveld short, faulty and wasty	4	"	5
O.F.S. Karoo grown, long and well-conditioned	6	"	6¼
O.F.S. medium grown, light, with little fault	5	"	5½
O.F.S. short, faulty, and wasty	4	"	4½

Mohair.—During the month there was a fairly active inquiry for winter hair, and a considerable quantity changed hands at 8d. to 8¼d., and winter kids at 13½d. to 14d.

There is practically no stock of this description of hair now left.

No summer hair changed hands this month.

The year is closing with a stock of about 2500 bales super firsts—all the strong firsts have been pretty well disposed of—700 bales of superfine summer kids, and oddments about 200 bales, or a total of about 3400 bales.

The following quotations must be taken as nominal for summer firsts and kids; the other prices quoted are those at present current:—

	d.		d.
Super kids	20	to	21
Ordinary kids and stained	15	"	18
Superior firsts, special clips	11	"	11¾
Ordinary firsts	10½	"	11
Short firsts and stained	9½	"	10
Superfine long blue O.F.S. hair	12	"	12½
Mixed O.F.S. hair (average)	10	to	11

	d.		d.
Mixed O.F.S. hair, very mixed	7	to	9
Seconds and grey	5	"	7½
Locks	4¾	"	5
Winter kids, special clips	13½	"	14
" good ordinary	11	"	12
Winter hair, short to full-grown	8	"	8¼
Basuto hair	10¼	"	10¼

Skins.—Show an all-round improvement. We sold this week:—Sheepskins, 5d. per lb.; damaged, 4d. per lb. Pelts, 2¾d. per lb.; damaged, 1¾d. per lb. Hair capes, 2s. 8d; sundried, 1s. 8d. each; cut, 1s. 1d. each; damaged, 6½d. each. Coarse wools, 4½d. per lb.; Goat, 13½d. per lb.; heavy, 10¼d. per lb.; sundried, 11½d. per lb.; damaged, 6¼d. per lb. Bastards, 11d. per lb.; damaged, 4½d. per lb. Angora, 8½d. per lb.; sundried, and heavy, 7½d. per lb.; shorn, 6¼d. per lb.; damaged, 3¼d. per lb. Springbok, 9d. each. Johannesburg sheep, 4¼d.: damaged sheep, 3¼d. Pelts, 2¼d. Goat, 10¼d.; damaged, 5¼d. Angora, 6¾d.; damaged, 2¼d. per lb.

Hides.—Sundried, 9¼d.; damaged, 8d; salted, 8¼d.; damaged, 7d.

Horns.—3½d. each all round.

EAST LONDON.

Messrs. Malcomess & Co., Ltd., report for the month of December:—

Wool Market.—Under this heading we can only report that a very fair business has been done at a level of prices which, though generally satisfactory to the seller, has been somewhat irregular. Long wools have been keenly sought by the Bradford buyers, especially big prices being paid for light and sound stapled wools. The German and French trade has, however, also been filling requirements and a high level of values been maintained. Short wools have shared in the demand, spinners on the Continent especially appearing to require grist for the mills, probably having orders in hand.

In the local auctions—

6th December—	5370	bales were offered	and	3300	sold.
13th "	5748	"	"	3700	"
20th "	5700	"	"	3000	"

but the sales by private treaty have been very considerable, and during the month under review fully 25,000 bales have been taken out of the market.

News from Home shows that there has been a better demand, though not on a higher price level, and the giving out of orders by the German military authorities for uniforms may possibly be the reason for the activity in a part of the trade there.

In Bradford the quotations for tops may be registered at about 24½d. for average tops against 25d. in the middle of the month and 24½d. to 24¾d. at the end.

This month also saw the sixth series of London Colonial Wool Sales in progress, opening on the 28th ultimo without any change in prices of either longs, shorts, or snow-whites, although later heavy combings receded about 5 per cent. The closing results advised :—Snowwhites and super combings par to 5 per cent. higher, while short wools were unchanged and all wasty heavy wools quite 5 per cent. lower.

For the coming series prices may be maintained, but it will not do to lose sight of the fact that heavy imports will now be coming to hand, and the first series of the year 1912 may see a drop in some grades.

Out of 128,500 bales available in the sixth series, including 25,500 bales Capes, 9000 bales Australians and 1000 bales Capes were withdrawn and are being held over for next series.

We quote as follows :—

	d.		d.		d.		d.
Transkei grease	5¼	to	7	Good short grassveld, well-conditioned	5	to	6½
Basuto grease	5	,,	5¾	Long northern O.F.S., well-ditioned	6½	,,	7¾
Ordinary native grease	5	,,	5¾	Long southern O.F.S., well-conditioned	5	,,	7
Super long-skirted Kaffrarian farmers	8	,,	11¼	Short faulty grease	4	,,	5¾
Super short-skirted Kaffrarian farmers	7	,,	9	Coarse and coloured grease	3	,,	5
Good long-grassveld, well-conditioned	6	,,	8				

Mohair.—In this line some business has been doing, but in Europe the spinners are still continuing a hand-to-mouth policy. Basutos have been selling at 10d., but stocks in town are small at present. We quote :—

	d.		d.		d.		d.
Superior kids, when available	17	to	19	Average long blue hair	10	to	11
Average ,, ,, ,,	16	,,	18	Mixed O.F.S	9	,,	11
Winter kids	10	,,	12	Seconds and greys	5	,,	6
,, hair	7	,,	8¼	Thirds	4½	,,	5
Superior long blue hair	11	,,	12	Basuto hair	9	,,	10¼

Sundry Produce.—S. D. hides, 9¼d ; D. S. hides, 8d. Goat-skins, 12¾d. Angora skins, 9d. ; damages, 5d. each. Sheepskins, 5¼d. for 1st quality ; 4¼d. for C. and C. skins ; 2¾d. for pelts, and 3½d. to 3¾d. for Transkei parcels.

DURBAN.

Messrs. Reid & Acutt's Wool Mart, Ltd., Esplanade, Durban, report as follows under date 29th December, 1911 :—

Wool.—The month now closing has been a very busy one for all concerned in the trade here. Arrivals have been very heavy, and weekly catalogues have attained large dimensions.

The market generally has shown no great change ; well-grown, light-conditioned wools remain in keen demand at excellent rates, but, as we forecasted in our last, heavy-conditioned, fatty clips have been duller, and these latterly have only been saleable at rates increasingly in buyers' favour.

The clip of Mr. F. Fick, of Amersfoort, fetched up to 11¼d. for lamb's, and an average of 9⅜d. for the other fleeces. The clips of Messrs. A. & V. Robertson and Robertson Bros., both of Amersfoort, totalling 248 bales and representing the product of close on 10,000 sheep, also sold extremely well, the fleeces fetching the following prices :—

A. & V. R.	23	bales	hoggetts	10⅝d.	per lb.
	34	,,	ewes	10¼d.	,,
	35	,,	wethers	10⅛d.	,,
R. Bros.	31	,,	ewes	10⅛d.	,,
	13	,,	hoggetts	9⅞d.	,,
	27	,,	wethers	9⅝d.	,,

It may interest sheep-farmers to know that these two clips averaged all round from fleeces to locks just on 9d. per lb.

The clip of Mr. J. S. Thompson, of Senekal, also sold well, the hoggetts making 10½d. and other fleeces 9½d.

The following are the prices current here to-day :—

NATAL AND EAST GRIQUALAND.

Midlands.

	d.		d.
Long light sorted clips	10	to	12
Unsorted clips, light and clean	8½	,,	10¼
Bellies, pieces, etc.	4	,,	7½

Ladysmith, Newcastle, Dundee, etc.

	d.		d.
12 months' sorted clips, light and clean	8½	to	10
12 months' average clips, light and clean	7¼	,,	8½
12 months' heavy and faulty	6½	,,	7
6 to 9 months' light and clean	6	,,	6¾
6 to 9 ,, heavy and faulty	5¼	,,	5¾

Utrecht and Vryheid.

	d.		d.
12 months' sorted clips, light and clean	7½	to	9
12 months' average clips, light and clean	6¾	,,	7½
12 months' heavy and faulty	6¼	,,	6¾
6 to 9 months' light and clean	5¾	,,	6¾
6 9 ,, heavy and faulty	5¼	,,	5¾

East Griqualand.

	d.		d.
12 months' sorted clips, light and clean	8½	to	9½
12 months' average clips, light and clean	7	,,	8¼
12 months' heavy and faulty	6½	,,	7
6 to 9 months' light and clean	6	,,	6¼
6 to 9 ,, heavy and faulty	5¼	,,	5¾

TRANSVAAL.

Volksrust, Wakkerstroom, Ermelo, Amersfoort, etc.

	d.		d.
12 months' sorted clips, light and clean	7¾	to	9
12 months' average clips, light and clean	7	,,	7¾
12 months' heavy and faulty	6½	,,	7
6 to 9 months' light and clean	6¼	,,	6¾
6 to 9 ,, heavy and faulty	5½	,,	6

Standerton, Bethal, Middelburg, etc.

	d.		d.
12 months' sorted clips, light and clean	7¼	to	8
12 months' average clips, light and clean	6¾	,,	7½
12 months' heavy and faulty	6¼	to	6¾
6 to 9 months' light and clean	5¾	,,	6½
6 to 9 ,, heavy and faulty	5	,,	5½

Heidelberg, Pretoria, Potchefstroom, Klerksdorp, Lichtenburg, etc.

	d.		d.
12 months' sorted clips, light and clean	7	to	7¾
12 months' average clips, light and clean	6½	,,	7
12 months' heavy and faulty	6	,,	6½
6 to 9 months' light and clean	5½	,,	6
6 to 9 ,, heavy and faulty	4¾	,,	5¼

ORANGE FREE STATE.

Harrismith, Vrede, Bethlehem, Heilbron, etc.

	d.		d.
12 months' sorted clips, light and clean	7½	to	9
12 months' average clips, light and clean	6¾	,,	7½
12 months' heavy and faulty	6¼	,,	6¾
6 to 9 months' light and clean	6¼	,,	6¾
6 to 9 ,, heavy and faulty	5½	,,	6

Lindley, Kroonstad, Vredefort, Parys, etc.

	d.		d.
12 months' sorted clips, light and clean	7½	to	8½
12 months' average clips, light and clean	6¾	,,	7½
12 months' heavy and faulty	6¼	,,	6¾
6 to 9 months' light and clean	5¾	,,	6½
6 to 9 ,, heavy and faulty	4¾	,,	5½

Senekal, Ficksburg, Ladybrand, Winburg, etc.

	d.		d.
12 months' sorted clips, light and clean	7	to	8½
12 months' average clips, light and clean	6½	,,	7
12 months' heavy and faulty	6	,,	6½
6 to 9 months' light and clean	5¾	,,	6¼
6 to 9 ,, heavy and faulty	4¾	,,	5½

Coarse and Coloured.

	d.		d.
Free from kemps	4	to	5
Ordinary	3	,,	4
Inferior, kempy, and Persian	1	,,	2

BASUTOLAND AND NATIVE WOOLS.

	d.		d.
Superior lots, light and clean	5¾	to	6¾
Average lots, light and clean	5	,,	5¾
Average lots, heavy and wasty	4¾	to	5

MOHAIR.

	d.		d.		d.		d.
Kids, good length and super quality	13	to	16	Ordinary lots	8	to	9
Long blue, super quality	11	„	12½	Short and mixed winter	7	„	8
„ average	10	„	11	Inferior and coloured	4	„	6

BASUTOLAND AND NATIVE MOHAIR.

	d.		d.		d.		d.
Average lots, mixed quality	9	to	10	Average lots, inferior	6	to	8

HIDES, SKINS, HORNS, ETC.

Hides.—Sundried, 14 to 20 lb. average, 8d. to 8¾d. per lb.; sundried, inferior, 5d. to 7d.: salted, 6½d. to 7½d.

Sheepskins.—Long-woolled, 4¼d. to 4¾d. per lb.; short-woolled, 3d. to 4d. Pelts, 1d. to 2½d.; coarse and coloured, 2d. to 3½d.; salted, heavy, 3½d. to 4d.

Goatskins.—Mixed parcels, sound, 3d. to 4d.; inferior, 1d. to 2½d.

Horns.—3d. to 10d. per pair.

Wattle Bark.—Cut and bagged, good colour and quality, 5s. 9d. to 6s. 3d. per cwt.: cut and bagged, inferior colour and quality, 4s. 6d. to 5s. 6d.; uncut in bundles, good colour and quality, 5s. to 5s. 6d.; uncut in bundles, inferior colour and quality, 2s. to 4s. 6d.

Notes on the Weather.

CAPE PROVINCE.—OCTOBER. 1911.

By C. M. Stewart, B.Sc.

Mean atmospheric pressure slightly lower than usual; days and nights considerably warmer than the average; very few and light frosts; an unusually high percentage of clouds; frequent fogs; a large number of thunderstorms, specially widespread on several days; some destructive hailstorms; heavy rainfall considerably above the normal depth except in the North and over the Cape Peninsula; a few hot winds in the East—such were the leading features of the weather of October, 1911.

Precipitation.—The mean precipitation during October as shown by 323 stations amounted to 2·56 ins. on seven days, being 0·74 in. or 41 % greater than usual. This amount is

Division.	Mean Rainfall (1911).	Mean No. of Days.	Average Rainfall (1891–1900).	Average No. of Days.	Actual Differences from Averages.	Percentage Differences from Averages.
Cape Peninsula.......	2·48	6	2·78	8	— 0·30	— 11
South-West..........	1·93	5	1·73	6	+ 0·20	+ 12
West Coast..........	0·96	4	0·80	4	+ 0·16	+ 20
South Coast..........	2·54	9	2·26	8	+ 0·28	+ 12
Southern Karoo......	1·68	3	0·91	4	+ 0·77	+ 85
West Central Karoo..	0·98	4	0·62	2	+ 0·36	+ 58
East Central Karoo..	1·57	6	0·66	3	+ 0·91	+ 138
Northern Karoo......	1·55	5	0·78	2	+ 0·77	+ 99
Northern Border.....	0·42	2	0·62	2	— 0·20	— 48
South-East...........	4·59	11	2·45	8	+ 2·14	+ 87
North-East...........	2·13	8	1·51	4	+ 0·62	+ 41
Kaffraria............	5·08	12	2·64	8	+ 2·44	+ 93
Basutoland...........	3·06	9	2·34	6	+ 0·72	+ 31
Orange Free State.....	2·50	7	1·42	3	+ 1·08	+ 78
Durban (Natal)......	—	—	4·46	—	—	—
Bechuanaland........	0·70	2	1·04	4	— 0·34	— 33
Rhodesia............	0·45	3	0·72	3	— 0·27	— 37

practically the same as last month, but 0·34 in. less than during the corresponding period of 1910. If the stations in the Orange Free State be included, the mean of the whole remains practically the same, viz., 2·54 inches. The accompanying tabular summary shows that the divisional means were considerably above the normals (except in the more northerly portions of the country and the extreme South-West), the excesses ranging from plus 138 % over the East Central Karoo to 12 % over the South-West and the South Coast. The only divisions experiencing a deficient rainfall were the Cape Peninsula (minus 11 %), Bechuanaland (— 33 %), Rhodesia (— 37 %) and the Northern Border (— 48 %). The actual surplus amounts were greatest over the South-East and Kaffraria, where they exceeded 2 inches. Compared with last month there was a considerable falling off in the amounts recorded over the Cape Peninsula, South-West, West and South Coasts, and the Central Karoo, but a large increase in the precipitation elsewhere, particularly over Kaffraria. A similar comparison with October of last year shows that there was a small increase over the South-West, West Coast, Southern, West Central and Northern Karoos, and the South-East, but a diminished precipitation elsewhere. Summarizing the monthly totals it is found that of 477 stations (including 154 in the Orange Free State), only five (5) experienced "absolute drought" throughout the month, four being in the Northern Border, and one in

the West Coast divisions, and 25 suffered from "partial drought", having 0·01–0·50 inches during the month; of the remainder 48 had 0·51–1·00 inches; 132 had 1·01–2 inches; 129 had 2·01–3 inches; 65 had 3·01–4 inches; 25 had 4·01–5 inches; 23 had 5·01–6 inches; 15 had 6·01–7 inches; 4 had 7·01–8 inches; and six (6) exceeded 8 inches, viz., Kubusie, 8·46 inches; Cata, 8·88 inches; Fort Cunynghame, 9·05 inches; Willowvale, 9·75 inches; Lusikisiki, 9·76 inches; and Evelyn Valley, 13·71 inches. As a matter of fact quantities exceeding six inches (6 inches) were confined exclusively to the South-East and Kaffraria. On similarly treating the maximum amounts recorded during the 24-hour period it is seen that of 317 stations furnishing the necessary particulars 79 had a *nil* to 0·50 inches; 107 had 0·51–1·00 inches; 108 had 1·01–2 inches; 19 had 2·01–3 inches; and four (4) exceeded 3 inches—Butterworth, 3·17 inches on 24th; Willowvale, 3·08 inches; Lusikisiki, 3·40 inches; and Evelyn Valley, 4·30 inches, all on the 2nd. In consequence of the heavy rains a lot of washaways are reported to have occurred on cultivated lands in the District of Stutterheim; good rains were experienced over the greater part of the country, but were very inadequate in the Caledon District. *Thunderstorms* were much more widely experienced than during the previous month or than in October of last year, 414 instances of their occurrence being reported on 24 days of the month, 1st to 6th, 10th to 14th, 17th to 18th, 20th to 29th, and on 31st. These storms were very widespread on 12th to 13th, 22nd to 24th, and 27th to 28th, but more particularly on 12th to 23rd, and 28th. *Hail* was also of exceptional frequency, being noted at 68 stations on 16 days, but chiefly on 24th and 28th. Considerable damage was done to crops at Ellismere by a hailstorm on the 24th, when the stones were reported to be of the size of hens' eggs; but the series of hailstorms on the 28th when practically the whole country was covered with a complicated mass of "secondaries"; thus at Polo "much damage to newly shorn sheep and crops"; Fort Cunynghame, "many windows broken; hailstones very large, many 6 inches to 6½ inches in circumference"; Kokstad, "large hail, damaging all fruit trees and gardens; window panes, about 3000, broken". No *snow* or *sleet* reported.

Temperature, Cloud, and *Wind*.—The mean monthly temperature of all stations was 63°·5 or 4°·5 warmer than in September and 2°·3 higher than during the corresponding period of last year. The mean maximum (73°·6) was 3°·1 higher than last month and 2°·1 higher than in October, 1910; and the mean minimum (53°·4) was 5°·8 higher than the preceding month, and 2°·5 higher than during the corresponding period of last year. The mean daily range was therefore 20°·1. A comparison with the normals shows that the mean day temperatures were 0°·8, and the mean night temperatures were 2°·5 higher than usual, thus causing the mean monthly temperature to be 1°·6 higher than the average. The individual stations show an excess of mean monthly temperature over the corresponding averages, amounting to 3–4 degrees over the Cape Peninsula and South-West, 1–2 degrees along the South and South-East Coasts, but falling to less than one degree over the greater part of the East and the interior. There were a few exceptions to these generalizations; thus, Kokstad and Sydney's Hope were 3°·0, Aliwal North 1°·7, and Umtata 1°·4 higher than usual; while Lovedale showed a deficit of 0°·2. The mean day temperatures were from 2–6 degrees above the average over the Cape Peninsula and South-West, generally about 1–2 degrees along the Coast; showed a deficit of 1–3 degrees at stations near the South Coast and parts of the South-East and Kaffraria, but showing an excess of about 2 degrees at the more central stations. The largest excesses were 6°·1 at Disa Head (Table Mountain) and 5°·8 at Hanover, and the greatest deficit 4°·3 at Lovedale, Bloemfontein being 2°·2 lower than usual. The mean night temperatures were everywhere higher than usual, the excesses being generally 3–4 degrees at those stations in the South-East and Kaffraria, and 1–3 degrees elsewhere, although rising to almost 5 degrees at Dunbrody and Uitenhage. The mean warmest station was Mochudi (75°·0) and the mean coolest Disa Head (Table Mountain), where the mean for the month was 56°·9, showing a difference of 18°·1. The highest mean maximum (91°·8) belongs to Mochudi and the lowest mean minimum (44°·9) to Hanover. The month was unusually warm throughout, particularly during the last half, the highest temperatures being registered on 18 days, 1st, 3rd, 4th, 9th to 11th, 14th to 18th, 22nd to 23rd, 27th to 31st, but principally on 3rd, 4th, and 9th in the West and South and 16th to 18th in the East. The lowest readings occurred from 1st to 3rd, 6th to 10th, 19th to 22nd, 25th to 26th, and 30th, but most widely on 8th and 19th. The mean value of the extreme maxima (87°·3) was 2°·3 lower, and the mean of the extreme minima (44°·5) was 4°·4 higher than during October, 1910; the mean monthly range was therefore 42°·8. The only station having a temperature of 100° or over was Mochudi, where 102° was recorded on the 14th to 29th; whilst at no station did the shade minimum temperature fall to 32°, the nearest approach to this being 34°·0 at Hanover on the 7th, causing an extreme monthly range of 68° over all stations. The number of *frosts* reported was unusually small, only ten instances being noted on ten days—7th, 8th, 10th, 18th to 20th, 25th, 26th, 29th to 30th; these were light, no damage being reported.

At Retreat in the Cape Peninsula, the mean minimum over grass was 52°·9 or 5°·4 lower than the shade minimum; the lowest reading was 31°·3 on 10th, when hoar-frost was noted, and the highest 55°·9 on 6th.

The mean amount of *cloud* (55 %) was unusually large, being 9 % more than during the previous month and during October, 1910. The mean percentage was greatest over the South-East, where it was 69 %, closely followed by the South Coast stations with 68 % and Kaffraria with 61 %; elsewhere the mean cloudiness was between 45 to 50 %, except over the Southern and Northern Karoos, where the amount of sky obscured was between 30 and 40 %, and Bechuanaland, where it fell below 20 %. The skies were cloudiest (80 %) at East London and clearest (5 %) at Mochudi.

Fogs and mists were of much more frequent occurrence than usual, 181 instances being noted on thirty days, most widely on 19th to 21st. The prevailing wind direction was northerly at Port Nolloth, southerly to south-easterly over the South-West and South Coast, westerly from Cape St. Francis to Port St. Johns, easterly and south-easterly over the interior, but north-easterly at Kokstad and Mochudi, whilst at Durban winds from north-east and south-west were of equal frequency.

The mean *force* on the Beaufort Scale was 1·84, corresponding to a velocity of 7·5 miles per hour or 0·1 miles per hour less than last month and 1·6 miles per hour less than during October of last year The winds were strongest in the West, South-West, and South. The Royal Observatory (Cape Peninsula) records show a large excess of north-westerly winds and a slight increase of those from west-north-west, south-east, and south-south-east, but a decrease of those from all other directions. The mean hourly velocity was 7·3 miles per hour or 0·1 mile per hour greater than usual. Strong *winds* and *gales* were of much less frequent occurrence than during either the previous month or October, 1910, being reported from only seventeen stations on eight days, mainly 17th, 22nd, and 1st. Two *duststorms* were noted during the month, and *hot winds* occurred in Natal on 18th. The mean barometric pressure at the Royal Observatory was 30·07 inches or 0·01 inches less than usual, ranging from 30·27 inches on the evening of the 25th to 29·80 on the morning of the 12th.

TEMPERATURE.

Station.	Mean Max.	Mean Min.	Monthly Mean	Abs. Max.	Date.	Abs. Min.	Date
Royal Observatory.........	71·2	55·4	63·3	84·0	3rd	47·4	10th
Capetown(SouthAfricanColl.)	73·6	53·9	63·8	86·0	3rd	46·0	9th & 10th
Capetown (City Hospital)...	70·9	55·0	63·0	82·9	3rd	46·8	9th
Capetown (Gardens).......	78·6	56·4	67·5	98·0	27th & 28th	48·0	30th
Blaauwberg..............	68·1	54·9	61·5	76·0	3rd & 22nd	50·0	19th
Wynberg..	73·8	52·5	63·2	87·0	3rd	47·5	21st
Bishopscourt.......... ...	69·5	50·7	60·1	84·0	3rd	46·0	21st
Retreat................. ..	71·5	52·9	62·2	85·0	3rd	39·7	16th
Table Mountain (Disa Head)	64·4	49·4	56·9	83·0	9th	41·0	19th
Groot Constantia..........	69·5	53·1	61·3	83·0	3rd	48·0	19th & 20th
Groot Drakenstein.........	76·4	52·6	64·5	89·0	9th	43·3	8th
Elsenburg (Agricultural Coll.)	73·7	52·3	63·0	85·2	27th	43·8	21st
Danger Point............	64·5	55·7	60·1	74·9	3rd	50·0	7th
Port Nolloth............	64·4	50·4	57·4	84·0	1st	46·0	20th
Anenous.................	80·8	65·2	73·0	94·0	9th & 10th	54·0	6th*
Cape St. Francis.........	66·6	57·6	62·1	70·0	9th	51·0	9th
Dunbrody...............	78·2	55·3	66.8	92·7	16th	42·0	8th
Heidelberg...............	74·9	52·8	63·8	86·0	3rd	42·0	19th & 20th
Port Elizabeth...........	70·0	57.5	63·8	80·0	4th	50·0	8th
Uitenhage..............	76·8	55·7	66·2	86·8	4th	42·5	8th
George (Plantation).......	68·4	52·7	60·6	82·0	4th	46·3	19th
Mossel Bay..............	69·7	54·8	62·2	81·0	4th	45·0	19th
Cape Agulhas............	66·3	57·1	61·7	71·0	11th, 23rd, & 30th	50·0	19th
Amalienstein.............	78·1	51·2	64·6	87·0	31st	38·0	20th
Hanover.................	79·5	44·9	62·2	89·0	15th	34·0	7th
Murraysburg.............	76·8	48·8	62·8	91·9	17th	37·0	2nd
East London............	70·5	59·5	65·0	89.0	30th & 31st	50·0	2nd

Station.	Mean Max.	Mean Min.	Monthly Mean.	Abs. Max.	Date.	Abs. Min.	Date.
Lovedale	73·5	53·7	63·6	91·0	16th	43·0	8th
Chiselhurst	76·0	56·8	66·4	90·0	16th	52·0	8th & 25th
Evelyn Valley	66·6	47·9	57·2	87·0	16th	40·0	8th
Bedford	72·5	51·3	61·9	92·0	16th	40·0	8th
Kingwilliamstown	75·0	54·9	65·0	98·0	16th	47·0	7th & 8th
Cathcart	73·4	49·6	61·5	87·2	18th	42·2	22nd
Sydney's Hope	72·2	53·5	62·8	87·5	16th	46·2	8th
Aliwal North	78·4	47·0	62·7	90·5	18th	37·0	8th
Main	71·2	52·1	61·6	95·8	18th	43·8	26th
Kokstad	72·5	49·6	61·0	91·5	18th	41·7	8th
Umtata	73·2	54 1	63·6	92·0	17th & 18th	45·0	26th
Tabankulu	71·8	51·5	61·6	90·6	18th	41.7	26th
Teyateyaneng	76·0	47·4	61.7	90·0	17th & 18th	40·0	1st, 3rd, 8th & 26th
Kuruman	84·5	51·8	68·2	96.0	17th	36·0	2nd
Mochudi	91·8	58·2	75·0	102·0	14th & 29th	42.0	1st
Bloemfontein	78 7	51·8	65·3	93·4	17th	42·6	14th
Motopo Park	84·9	58·6	71·3	95·0	30th	49·0	7th
Means	73·6	53·4	63·5	87·3		44·5	
Extremes				102·0	14th & 29th	34·[illegible]	7th

OBSERVERS' NOTES.

Karnmelk's River (Caledon)— Rain badly needed for crops. The little that fell was dried up almost at once by the strong wind.

Kruis River.—Owing to the rains of 28th to 30th September, and nice showers during this month, a great deal of ploughing has been due. Mealies, water and sweet melons, pumpkins, beans, etc., have been sown. Ground in fine condition. Veld looking splendid. stock doing well. This has been a most genial month. Early sown water and sweet melons suffered from the depredation of some insect, which has devastated some lands entirely and has necessitated a resowing of seed.

Rainfall, though good, below average of last ten years. Slight thunder on four occasions.

Theefontein (Hanover).—Cool, pleasant weather this month, with an unusually good rainfall in parts. Veld good and stock in excellent condition. No frosts. Winds, mainly light and variable.

Sunnyside (Hay).—The principal features of October, 1911, are, *firstly*, an exceptional number of cloudy days, though there is a considerable decrease in rainfall when compared with October, 1910; and, secondly, the very hot and sultry weather experienced during the latter part of the month. Fruit trees bearing poorly, especially peaches, which are infested with a plague entirely unknown in these parts. This disease is in the form of a tiny green-hued insect living on the leaves and causing them to curl up in a most peculiar manner. Stock in fair condition.

	Rain.	Calms.	Clouds.
1910	1·34 inches	4 days	17 days.
1911	0·33 „	5 „	24 „

Huxley Farm.—Rain is getting too much for sheep. A lot of washaways on cultivated lands. No less than five storms on the 24th instant. Rivers have been very high and no bridges!

Clifton (Sterkstroom).—Veld good. Fruit crop promising. Crops poor.

Kokstad.—A good few birds were killed by the hail on the 28th.

Groot Drakenstein.—Mean temperature of month 3°·4 above the average. Mean maximum of month 4°·8 above the average. Rainfall 0·44 inches below average (85 %).

Kokstad (Coyte).—A very severe hailstorm swept the town and certain farms on the evening of the 28th, destroying all fruit, vegetables, and flowers, breaking some 2000 panes of glass in town; and the one and a half inches of rain which fell flooded several houses. on the roofs of which the hail lodged. The stones weighed from 1 oz. to 1½ oz. The fruit crop was the most promising for years, but was utterly destroyed.

SUMMARY OF METEOROLOGICAL OBSERVATIONS TAKEN DURING THE MONTH OF OCTOBER, 1911.

A.—*Means.*

Station.	Barometer	Dry.	Wet.	Dew Point.	Rel. Hum.	Max.	Min.	Mean.	Range.
	Inches.	°	°	°	%	°	°	°	°
Ben Avis..........	—	62·9	53·2	45·5	55	74·3	47·5	60·9	26·8
Bethulie...........	25·907	61·0	55·2	47·7	56	78·3	48·5	63·4	29·8
Bloemfontein.......	25·551	64·6	54·6	46·4	52	78·7	51·8	60·3	26·9
Grootkuil..........	—	—	—	—	—	—	—	—	—
Harrismith.........	—	59·5	54·5	50·0	71	70·5	47.5	59·0	23·0
Holfontein.........	—	65·1	58·2	52·5	64	81·3	49·9	65·6	31·4
Imperani..........	—	61·9	54·3	47·4	60	75·5	49·4	63·5	26·1
Ladybrand.........	—	61·5	53·7	47·8	59	72·4	49·1	60·8	23·3
Lindley............	25·251	65·0	55·6	58·2	54	78·7	50·3	64·5	28·4
Modderpoort.......	24·929	61·0	54·8	49·6	66	74·7	46·5	60·6	28·2
Tweespruit.........	25·035	66·7	54·2	44·5	45	80·9	44·8	62·8	36·1
Vierfontein.........	—	67·6	58·1	51·0	55	82·2	51·1	66·7	31·1
Wepener.	—	—	—	—	—	—	—	—	—

B.—*Extremes.*

Station.	(*a*) Barometer.		(*b*) Temperature.	
	Maximum.	Minimum.	Maximum.	Minimum.
	Inches.	°	°	°
Ben Avis.............	—	—	83·3 on 18th and 31st	37·8 on 8th
Bethulie...............	26·018 on 26th	25·716 on 13th	92·5 on 17th	40·9 on 8th and 26th
Bloomfontein...........	25·668 on 8th	25·398 on 13th	93·4 on 17th	42·6 on 14th
Grootkuil..............	—	—	—	—
Harrismith.............	—	—	83·9 on 18th	35·0 on 8th
Holfontein.............	—	—	95·2 on 19th	39·0 on 8th
Imperani..............	—	—	88·4 on 17th	41·0 on 5th and 15th
Ladybrand.............	—	—	87·4 on 18th	42·0 on 2nd and 3rd
Lindley................	25·360 on 8th	25·118 on 1st	92·5 on 19th	42·0 on 1st
Modderpoort...........	24·983 on 10th	24·797 on 13th	87·6 on 18th	41·2 on 9th
Tweespruit.............	25·121 on 8th	24·940 on 17th	93·8 on 18th	34·0 on 15th
Vierfontein.............	—	—	96·1 on 20th	34·0 on 1st
Wepener............. .	—	—	—	—

NATAL PROVINCE.—NOVEMBER.

THE usual free rainfall, with short dry intervals, has to be recorded for the month of November. Along the coast from Port Shepstone to Empangeni an average of 4·58 inches was taken on thirteen days; in the Midlands the average rises to 5·30 inches on fifteen days; but at the Northern and North-Western Stations it falls again to 3·73 inches on ten days. In Zululand at the higher stations the average was 4·98 inches on eleven days. There was a good deal of misty weather and light drizzle. Several thunderstorms visited the up-country stations during the month, and hail was reported from Howick on the 4th, Richmond on the 10th, Ngomi Forest on the 15th, Eshowe on the 16th and 28th, Bulwer on the 21st, Nottingham Road on the 22nd, and Mahlabatini on the 28th. At fourteen stations out of a total of thirty-nine most rain was taken on the 21st, at nine on the 22nd,

and at six on the 20th, and at most places the second half of the month included more wet days than the first.

Particulars of the temperature for November at thirty-six stations are given in the following table. It is intended to continue the publication of similar tables from month to month.

TEMPERATURE (NATAL), NOVEMBER.

Station.	Mean Maximum.	Mean Minimum.	Monthly Mean.	Abs. Maximum	Abs. Minimum.	Mean Daily Range.
	°	°	°	°	°	°
Observatory, Durban	78·1	64·6	71·3	87	60	13·5
Stanger	79·9	59·5	69·7	105	58	20·4
Verulam	81·7	63·1	72·4	96	57	18·6
Hillary	75·6	62·9	69·3	87	57	12·7
Umbogintwini	79·8	63·4	71·6	89	58	16·4
Winkle Spruit	78·3	61·5	69·9	88	52	16·8
Port Shepstone	78·2	62·2	70·2	91	58	16·0
Imbizana	79·4	61·2	70·3	95	55	18·2
Umzinto	90·4	50·7	70·5	95	49	39·7
Mid-Illovo	71·1	57·6	64·4	92	52	13·5
Bulwer	69·0	51·4	60·2	84	44	17·6
Richmond	76·5	56·1	66·3	96	51	20·4
Himeville	77·0	50·8	63·9	89	42	26·2
Pietermaritzburg	78·9	57·7	68·3	98	50	21·2
Cedara Vlei	74·0	53·8	63·9	92	44	20·2
Howick	77·2	55·8	66·5	94	48	21·4
New Hanover	86·3	57·8	72·0	99	50	28·5
Krantzkop	82·7	60·5	71·6	91	55	22·2
Greytown	81·3	56·0	68·7	93	48	25·3
Lidgetton	81·5	46·8	64·1	94	37	34·7
Nottingham Road	75·0	50·1	62·6	89	40	24 9
Estcourt	91·7	50·4	71·0	94	43	41·3
Weenen	89·6	56·6	73·1	102	52	33·0
Mpofana	79·9	57·3	68·6	96	50	22·6
Ladysmith	87·4	59·2	73·3	98	50	28·2
Dundee	84·3	58·4	71·4	92	51	25·9
Newcastle	86·4	54·4	70·4	96	47	32·0
Vryheid	78·4	55·6	67·0	93	49	22·8
Paulpietersburg	87·1	53·8	70·4	95	45	33·3
Ngomi Forest	70·6	53·6	62·1	83	49	17·0
Ubombo	73·5	63·7	68·6	82	56	9·8
Hlabisa	76·2	61·7	69·0	85	60	14·5
Mahlabatini	79·4	49·8	64·6	80	40	29·6
Melmoth	78·8	58·3	68·5	97	53	20·5
Empangeni	84·0	63·0	73·5	98	57	21·0
Mtunzini	83·2	49·5	66·4	86	40	33·7
MEANS	80·1	56·9	68·5	—	—	23·2
EXTREMES	—	—	—	105	37	—

OBSERVERS' NOTES.

Imbizana.—Rainfall during the month was 5·21 inches, a very satisfactory quantity. The temperature has been on the whole fairly cool for the time of year. As this is the best planting month of the year for this part of Natal, the weather has been very favourable for the crops and the outlook is good. Where dipping tanks are in use the cattle are doing wonderfully well; East Cost fever will soon have finished all the rest. (C. H. Mitchell.)

Mid-Illovo District.—The weather during the month has been exceptionally misty, and although the rainfall only totals 4·20 inches, rain was registered on 26 days. There has been hail in the adjacent districts. Ploughing and mealie planting is going on apace, and where sheds have been erected wattle barking continues. (J. W. V. Montgomery.)

Nottingham Road.—Higher temperature during the day than usual, with very heavy thunderstorms in the afternoon, many accompanied by quantities of small hail. Only

one storm, however, damaged crops in the Tweedie district, when the hailstones broke some windows on a passenger train. Stock is very healthy. Nearly all the top prices for wool in the recent sales have been gained by wool-growers in this district. Cutworm has done more damage than usual to crops.

Empangeni.—The weather has been on the whole very fair, but there was one heavy storm, with thunder and lightning, on the 21st. All stock in the district (consisting mostly of donkeys and mules) looking well; also all crops. (H. Tarboton.)

Ngomi Forest.—Rain fell on twenty-seven days with a total rainfall of 9·39 inches, which is a little less than November, 1910, when 9·44 inches fell. During the month we had several heavy thunderstorms; on the 16th the hail was very heavy and did a certain amount of damage to crops, etc.; the crops will recover from damage done. Crops are looking fairly well. There is still a fair number of cattle here; these are looking well. There seems to be a fair increase in young stock. (W. H. Foster.)

TRANSVAAL.

OBSERVERS' WEATHER REPORTS FOR OCTOBER, 1911.

SUMMARY.—The rainfall during the month was generally below the average. Over the northern portion of the Transvaal, and in the Barberton, Bethal, and Rustenburg Districts the deficit was most marked In the east (excepting the vicinity of Komatipoort) and the south-west the season's rainfall (five months) has reached the average, and over the eastern high veld has exceeded it. The remainder of the Province shows a deficit.

BETHAL DISTRICT

Leeuwkuilen.—During this month crops have suffered through the want of rain, especially oats and wheat. The cutworm has done a tremendous amount of damage in the vicinity, and, judging by accounts, it has been a general complaint; this is no doubt due to the partial drought experienced from 1st to the 18th of the month. Grass and crops were almost parched up, but freshened up by showers which occurred from 18th to 21st. Slight hail was experienced on the 9th, accompanied by rain. Good rain fell on the 29th. (W. J. Wayland.)

CAROLINA DISTRICT—

Waterval Boven.—A few very cold days were experienced. Hail fell in the vicinity, doing much damage to crops. (H. C. Borcherds.)

HEIDELBERG DISTRICT—

Heidelberg.—The weather throughout this month has been very unsettled and cloudy, with frequent short, heavy showers of rain accompanied by thunder and lightning. In the district people and cattle were killed by lightning. On the evening of the 11th a heavy hailstorm passed over the town from south to north, doing considerable damage to fruit trees, window-glass, etc. On the 28th a heavy hurricane made its appearance, travelling from S.S.E. to N.N.W., and doing damage to small trees and blowing over an iron shed. (W. A. ter Horst.)

LYDENBURG DISTRICT—

Belfast.—Welcome rains fell during the month. Hail accompanied several of the storms, and, consequently, all fruit is badly marked. The weather has been warm, with drying winds towards the close of the month. (G. J. Imrie.)

MARICO DISTRICT—

Kaffirskraal.—On the 22nd of this month a tremendous hailstorm was experienced on a portion of the farm Quaggafontein No. 47, slightly to the north of this station. (Corporal C. J. Brown, Transvaal Police.)

MIDDELBURG DISTRICT—

Middelburg.—Fair rains have fallen for November, quite up to the average, the fall on the 17th being the heaviest recorded for this month during nine years. The rainfall will, however, vary a good deal in different parts of the district, as many, and some very heavy, thunderstorms were very localized. The month has been, as usual, hot and muggy. (Dr H. A. Spencer.)

POTCHEFSTROOM DISTRICT—

Venterskroon.—An abnormally heavy rainstorm passed over Venterskroon and its immediate vicinity on the afternoon of the 28th. The storm approached from the west about 3.30 p.m. and was accompanied by hail, a severe hailstorm occurring about 3.45 and another much less severe about 4.55 p.m. From 3.30 p.m. to 5.50 p.m. the amount of rain which fell was 3·65 inches. The storm did considerable damage—dams were burst

and washed away, and a footbridge at this village was utterly demolished. In one place a field of oats was washed clean. The storm appears to be confined to a belt from about four miles north to four miles south of this village; outside this belt the rain was not too severe. Total rainfall for twenty-four hours, 4·36 inches, which does not include hail. (Lance-Corporal T. S. Bradshaw, Transvaal Police.)

WAKKERSTROOM DISTRICT—

Wakkerstroom.—Several hailstorms were experienced during this month; no damage, except on the 9th, when it was but slight. (W. Pritchard.)

WATERBERG DISTRICT—

Rhenosterpoort.—Rain fell very heavily in the vicinity of this station a good deal during the month, but within five miles of this station the farmers have not been able to plough on account of its being so dry. The rainfall has mostly been to the west and north-west of this station. (Constable S. Salter, Transvaal Police.)

ZOUTPANSBERG DISTRICT—

Louis Trichardt.—Excessive heat and drought have characterized this month. On the 25th the maximum temperature reached 97·0° in the early afternoon and remained above 90° until sundown. The ill-effects of the drought were only very slightly counteracted by 0·67 inches of rain recorded on eight days, of which 0·32 inches was recorded on the 23rd. The weather has proved extremely favourable for the ripening of early cereals, some remarkably good crops of wheat and barley (the latter for malting purposes) having been harvested from experimental sowings in the neighbourhood; but the present outlook for mealies and other late crops is very gloomy, and, in many cases, resowing will have to be resorted to when rain comes. (Sergeant J. C. N. Clark, Transvaal Police.)

Pietersburg—Scarcity of rain has been severely felt; the hot days experienced soon absorbed the little rainfall. Veld poor and crops suffering from drought. (W. J. Frankleyne.)

The Rainfall for November, 1911.

CAPE PROVINCE.

I. Cape Peninsula :

Station	Inches.
Royal Observatory (*a*) 12-inch gauge	1·19
Capetown (Fire Station)	1·76
Do. (Hospital)	0·89
Sea Point (The Hall)	1·12
Camp's Bay	0·49
Table Mountain (Disa Head)	1·92
Do. (Kasteel Poort)	3·59
Do. (Waai Kopje)	3·60
Do. (St. Michael's)	4·26
Woodstock (The Hall)	1·58
Bishopscourt	2·33
Kenilworth	1·38
Wynberg (St. Mary's)	1·55
Groot Constantia	1·71
Tokai Plantation	1·54
Muizenburg	1·04
Cape Point	0·28
Blaauwberg Strand	0·21
Robben Island	0·57
Maitland Cemetery	0·65
Tamboers Kloof	1·48

II. South-West :

Station	Inches.
Eerste River	0·39
Klapmuts	0·57
Stellenbosch (Gaol)	0·48
Somerset West	0·80
Paarl	0·00
Wellington (Gaol)	0·40
Groot Drakenstein (Weltevreden)	0·85
Porterville Road	0·57
Tulbagh	0·48
Ceres Road	1·30
Rawsonville	0·00
Caledon	0·85
Hex River	0·26
Lady Grey (Division Robertson)	0·04
Robertson (Gaol)	0·27
Do. (Govt. Plantation)	0·34
Montagu	0·00
Danger Point	0·72
Elgin Plantation	1·54
Elsenberg Agricultural College	0·46
Roskeen	1·74
Vruchtbaar	0·65
Ceres (Heatlie)	1·13
Waverley	0·47
Dwaars Riviers Hoek	1·79
De Doorns	0·00

III. West Coast :

Station	Inches.
Port Nolloth (Lieut. Barber)	0·00
Kraaifontein	0·00
Springbokfontein	0·00
Concordia (Krapohl)	0·08
Garies	0·30
Van Rhyn's Dorp	0·15
Dassen Island	0·63
Kersefontein	0·18
The Towers	0·44
Malmesbury	0·28
Piquetberg	1·35
Wupperthal	0·00
Hopefield	*0·30
Algeria (Clanwilliam)	0·49
Cedarberg (Clanwilliam)	1·03

IV. South Coast :

Station	Inches.
Cape Agulhas	0·32
Swellendam	2·46
Grootvaders Bosch	5·52
Heidelberg	1·08
Mossel Bay	1·14
Great Brak River	1·54
George	9·45
George (Plantation)	3·55
Millwood	2·92
Sour Flats	1·71
Concordia	2·45
Buffel's Nek	3·58
Plettenberg Bay	0·84
Harkerville	2·30
Lottering	3·22
Storms River	2·61
Humansdorp	0·42
Cape St. Francis	0·23
Kruis River	0·26
Uitenhage (Gaol)	0·62
Do. (Park)	0·51
Do. (Inggs)	0·60
Armadale (Blue Cliff)	0·81
Dunbrody	0·90
Port Elizabeth (Harbour)	0·25
Do. (The Slip)	0·51
Do. (Walmer Heights)	0·41
Shark's River (Nursery)	0·23
Centlivres	0·79
Edinburgh	2·11
Blaauwkrantz	0·68
Gamtoos Siding	0·41

V. SOUTHERN KAROO:

	Inches.
Triangle	0·15
Pietermeintjes	0·12
Ladismith	1·13
Amalienstein	1·50
Calitzdorp	0·48
Oudtshoorn	1·20
Uniondale	1·78

VI. WEST CENTRAL KAROO:

Prince Albert	0·58
Dunedin	1·99
Nels Poort	1·84
Camfers Kraal	1·08
Krom River	1·29
Baakens Rug	1·41
Willowmore	1·45
Rietfontein	0·88
Steytlerville	1·53

VII. EAST CENTRAL KAROO:

Aberdeen (Gaol)	0·68
Aberdeen Road	0·55
Graaff-Reinet (Gaol)	1·63
Do. (Eng. Yard)	1·44
New Bethesda	1·53
Glen Harry	1·56
Wellwood	2·26
Jansenville	0·72
Roode Hoogte	2·36
Toegedacht	0·77
Klipfontein	1·71
Cranemere	1·33
Somerset East (Gaol)	2·11
Spitzkop (Graaff-Reinet)	2·46
Zeekoe River	1·06

VIII. NORTHERN KAROO:

Sutherland	0·69
Fraserburg	1·25
Carnarvon	1·46
Brakfontein	1·07
Victoria West	0·77
Britstown	2·18
Wildebeestkooij	1·70
Murraysburg	0·96
Richmond	2·02
Hanover	2·44
Theefontein	2·13
Petrusville	2·58
The Willows (Middelburg)	3·02
Colesberg	3·71
Fish River	1·51
Maraisburg	2·04
Steynsburg (Gaol)	3·38
Tarkastad	2·20
Waverley	3·47
Schuilhoek	2·71
Vosburg	1·32
Hotwegkloof	1·25
Thebus Waters	2·56
Ruightersfontein	2·66
Zoetvlei (Richmond)	2·26
Klipkraal (Richmond)	1·54

IX. NORTHERN BORDER:

	Inches.
Pella	0·55
Kenhardt	0·72
Upington	0·99
Van Wyks Vlei	0·51
Prieska	1·73
New Year's Kraal	2·66
Dunmurry	1·49
Karree Kloof	2·65
Douglas	1·66
Hopetown	3·24
Newlands (Barkly West)	1·85
Barkly West	1·35
Kimberley (Gaol)	1·59
Strydenburg	0·87
Dongles (Voss)	1·83
Rietfontein (Gordonia)	0·28
Stoffkraal	0·52
Sunnyside (Hay)	1·01
Sydney-on-Vaal	1·67
Warrenton	1·52

X. SOUTH-EAST:

Melrose (Division Bedford)	1·27
Dagga Boer	1·77
Alicedale	1·00
Cheviot Fells	2·92
Bedford (Gaol)	3·19
Do. (Hall)	2·83
Sydney's Hope	1·82
Adelaide	2·13
Atherstone	1·40
Alexandria	2·32
Fort Fordyce	3·65
Grahamstown (Gaol)	2·63
Heatherton Towers	2·81
Fort Beaufort	1·64
Katberg	3·76
Seymour	2·07
Glencairn	3·17
Hogsback	6·04
Peddie	1·35
Exwell Park	2·95
Keiskamma Hoek	2·22
Cathcart (Gaol)	3·16
Cathcart	3·48
Thaba N'doda	3·61
Evelyn Valley	8·25
Pirie Forest	3·75
Forestbourne	4·42
Isidenge	4·62
Kologha	3·99
Kingwilliamstown (Gaol)	1·65
Do. (Pym)	2·32
Fort Cunynghame	9·32
Dohne	3·46
Kubusie	3·74
Quacu	3·58
Blaney	1·65
Bolo	3·86
Fort Jackson	1·05
Chiselhurst	4·17
East London West	1·63
Cata	6·80
Wolf Ridge	5·52
Dontsah	3·91
Mount Coke	1·03

X. SOUTH-EAST (*continued*):

Station	*Inches.*
Albert Vale (near Bedford)	2·05
Huxley Farm	4·32
Insileni	3·78
Eastover	1·51
Debe Nek	4·02
Middle Drift	1·98

XI. NORTH-EAST:

Station	Inches.
Venterstad	2·71
Mooifontein	3·10
Burghersdorp (Gaol)	2·59
Lyndene	2·49
Brongtton	3·39
Thibet Park	3·22
Sterkstroom (Station)	4·14
Rocklands	2·57
Aliwal North (Gaol)	2·21
Jamestown	2·82
Queenstown (Gaol)	5·55
Middlecourt	3·39
Herschel	5·32
Lady Grey	5·37
Lauriston	2·38
Lady Frere	2·54
Contest (near Bolotwa)	3·06
Keilands	2·62
Barkly East	3·06
Hughenden	1·89
Clifton (Sterks.)	4·44
Avoca (Barkly East)	5·27
Philipdale (Bedford)	2·50

XII. KAFFRARIA:

Station	*Inches.*
Ida (Xalanga)	3·84
Slaate (Xalanga)	2·81
Cofimvaba	3·77
Tsomo	2·78
N'qamakwe	3·44
Engcobo	3·81
Butterworth	3·87
Kentani	3·62
Maclear	4·49
Idutywa	3·46
Bazeya	7·37
Willowvale	4·50
Somerville (Tsolo)	4·17
Elliotdale	3·35
Umtata	3·48
Cwebe	4·64
Tabankulu	4·22
Kokstad	4·05
Do. (The Willows)	4·40
Flagstaff	5·11
Insikeni	5·64
Port St. Johns	3·81
Umzimkulu	4·06
Wanstead	4·18
Maclear (Station)	5·14
Umzimkulu (Strachan)	4·51
Lusikisiki	4·88
Elton Grange	3·52
N'dabakazi	3·91
Clarkebury	3·38
Kilrush	4·55

NATAL—NOVEMBER.

Station	*Inches.*
Durban (Observatory)	3·47
Do. (Point)	2·85
Stanger	4·83
Verulam	4·07
Hillary	3·81
Umbogintwini	3·69
Winkel Spruit	3·50
Port Shepstone	4·60
Imbizana	5·21
Umzinto	4·38
Mid-Illovo	4·20
Bulwer	6·72
Himeville	4·26
Richmond	8·04
Pietermaritzburg (Asylum)	6·81
Do. (Burger Street)	6·06
Cedara (Vlei)	5·71
Howick	6·17
New Hanover	5·37
Krantzkop	3·01
Greytown	4·39
Ladgetton	6·39
Nottingham Road	5·67
Estcourt	5·46
Weenen	2·87
Mpofana	3·64
Ladysmith	4·14
Dundee	2·53
Newcastle	3·54
Utrecht	3·72
Vryheid	3·53
Paulpietersburg	4·90
Ngomi Forest	9·39
Ubombo	4·29
Hlabisa	5·30
Mahlabatini	6·70
Melmoth	3·62
Empangeni	7·31
Mtunzini	5·46

TRANSVAAL—NOVEMBER.

Station	*Inches.*
Barberton	2·42
Komatipoort	0·67
Bethal	3·42
Bloemhof	3·05
Christiana	1·20
Ermelo	3·93
Heidelberg	4·09
Vereeniging	3·00
Pilgrims Rest	2·03
Zeerust	3·25
Middelburg	5·35
Piet Retief	5·49
Potchefstroom	4·38
Klerksdorp	3·28
Pretoria (Arcadia)	4·77
Modderfontein	4·48
Rustenburg	1·40
Standerton	4·27
Volksrust	5·03
Wakkerstroom	4·67
Potgietersrust	2·37
Krugersdorp	3·72
Joubert Park	3·33
Observatory	3·50
Pietersburg	1·31
Leydsdorp	0·40

ORANGE FREE STATE—OCTOBER.

	Inches.
BETHLEHEM DISTRICT:	
Abersethin	2·84
Kaal Laagte	1·77
Kestell	4·24
Middelpunt	2·28
Novo	3·43
Reitz	3·37
Stolzkop	4·76
Whinburn	2·30
Rondekock	1·19
BETHULIE DISTRICT:	
Town	1·13
Niet te Weet	1·14
Normandale	2·61
BLOEMFONTEIN DISTRICT:	
The City—	
Arboretum	1·60
Government Laboratories	2·75
Grey College School	2·20
St. Michael's School	2·74
Dewetsdorp	1·58
Doornplaat	0·80
Dunmanway	1·08
Ellerslie North	1·57
Glen Lyon	2·60
Hosell	1·48
Kuilput	1·89
Mazelspoort	2·50
Nieuwjaarsfontein	2·65
Pukpoort	1·93
Reddersburg	2·05
Retreat	2·18
Roodepoort	3·08
Kromdraai	1·44
Sannah's Post	2·23
Tempe	2·60
BOSHOF DISTRICT:	
Brakfontein	1·88
Dealesville	0·96
Kalkpan	1·45
Kanonfontein	0·68
Knapdaar	1·34
Smithskraal	1·21
EDENBURG DISTRICT:	
Boomplaats	2·34
Excelsior	1·44
Bethany	2·53
FAURESMITH DISTRICT:	
Bergfontein	1·19
Brakdam	1·85
Klipnek	1·26
Koffyfontein	0·44
Lokshoek	2·77
Newlands	1·23
Tevredenheid	1·15
Middelfontein	1·22
Mimosa	2·16

	Inches.
FRANKFORT DISTRICT:	
Town	4·13
Muirtown	3·97
Dunedin	4·46
Vryheid	4·52
Zandoog	3·88
HARRISMITH DISTRICT:	
Afrika's Kop	5·24
Arbeid Adelt	4·21
Buckland Downs	5·36
Fandjesberg	3·57
Forest Station	5·19
Mill Barton	4·74
Hermitage	5·54
FICKSBURG DISTRICT:	
Dekselfontein	3·92
Caledon Draai	3·04
Dunblane	3·15
Ginton	3·16
Imperani	2·14
Kalkoenkrantz	3·74
Kranskloof	2·06
Lusthof	3·24
Platkop	2·66
Prynnsberg	2·03
Zuikerkop	2·92
Sandford	2·15
Kirklington	2·15
JACOBSDAL DISTRICT:	
Town	1·14
Aschboschdam	1·43
Aurora	1·28
Zoutpan	0·72
KROONSTAD DISTRICT	
Town	2·20
Geduldfontein	2·16
Hebron	3·41
Gelukfontein	2·38
Holfontein	2·60
Vierfontein Mine	2·21
Voorspoed	2·20
Waterford	1·93
LADYBRAND DISTRICT:	
Town	3·10
Alma	2·21
Braemar	2·04
Clocolan	2·58
Government Nursery	4·15
Lambertina	2·81
Molderpoort	3·75
Moria	2·34
Westminster	2·64
Zorgvliet	2·06
Rangershoek	1·87
HEILBRON DISTRICT:	
Beltrim	3·42
Groenvlei	3·01
Honing Kloof	3·20
Springbokvlaakte	2·43
Villiers	4·30

	Inches.
HOOPSTAD DISTRICT :	
Town	1·42
Fairfield	1·79
Lake Warden	0·94
Roodepoort	1·77
LINDLEY DISTRICT :	
Town	2·46
Kerry	2·22
Lindley Road	1·99
Waterford	2·04
Wexford	2·42
PHILIPPOLIS DISTRICT :	
Donkerpoort	1·11
Highway	2·44
Krielsfontein	2·72
ROUXVILLE DISTRICT :	
Town	3·76
Ben Avis	2·07
Clearwater	2·50
Ondefontein	2·23
Riversdale	2·12
Sterkfontein	3·94
SMITHFIELD DISTRICT :	
Helvetia	2·05
THABA 'NCHO DISTRICT :	
Town	2·79
Burgundy	1·80
Fort Bassett	3·39
Leeuw River Mills	2·31
Moroka Industrial School	2·80
Mount Stephen	2·53

	Inches.
THABA 'NCHO DISTRICT (contd.) :	
Ramalitsi	2·16
Strathearn	4·16
The Cliff	2·69
Tweespruit	2·71
Wilgeboom Nek	2·29
York	3·17
Likatlong	2·10
VREDE DISTRICT :	
Woudzicht	4·61
VREDEFORT DISTRICT :	
Bloemhof	2·63
Bodeskraal	1·13
WEPENER DISTRICT :	
Kalkfontein	2·03
Lucerne Valley	1·68
Mon Repos	2·57
Meander	2·13
Zamenloop	1·92
Wonderboom	2·82
WINBURG DISTRICT :	
Town	1·91
Bantry	2·39
Beddington	2·13
Burnet Holm	2·45
Hayfield	3·26
Paardekraal	2·59
Smaldeel	1·52
Vaalbankskuil	1·65
Foxhill	2·86
Excelsior	1·63

Results of Egg-Laying Competitions.

WESTERN PROVINCE AGRICULTURAL SOCIETY.

Fourth Egg-Laying Competition.—16th May, 1911, to 15th May, 1912.

Record for November, 1911, and Totals to End of November.

Pen Number.	Owner.	Breed. (Six Birds to a Pen.)	Record for Month. Eggs.	Weight. oz.	drams	Total to Date. Eggs.	Weight. oz.	drams.	Position to Date.
1	F. W. Nicholson..	Buff Orpingtons..............	55	118	0	292	618	0	24th
2	F. T. Hobbs	Silver Wyandottes............	55	108	7	327	640	11	22nd
3	A. Riley.........	Black Minorcas (R.C.).........	40	79	14	232	455	12	26th
4	N. Cole	White Leghorns (Amer.)	45	85	14	382	748	6	19th
5	S. T. Jones	White Leghorns (Amer.)	75	162	9	414	888	7	11th
6	H. Curtis..	White Leghorns (Amer.)	83	174	3	439	912	5	8th
7	S. C. Skaife......	White Wyandottes...........	52	94	13	352	633	5	23rd
8	A. Keppie.......	White Wyandottes...........	59	111	4	401	745	10	20th
9	S. A. West.......	White Leghorns (Amer.-Danish) (5 birds only, 1 died 5/11/11.)	56	119	7	393	849	14	14th
10	H. H. Bright.....	Black Leghorns	82	159	8	542	1074	0	3rd
11	B. Kauffmann ...	Brown Leghorns	84	163	0	415	843	9	16th
12	B. Kauffmann ...	Black Leghorns	63	134	9	389	836	13	17th
13	C. W. Pilkington .	Rhode Island Reds	56	120	13	279	615	14	25th
14	W. P. Cowan	White Leghorns (Eng.)........	74	147	12	537	1038	7	5th
15	A. J. Stacy......	White Leghorns (Aust.-Amer.) (Re-entered from last competition for second year test.)	99	202	5	539	1136	2	1st
16	B. Kauffmann ...	White Leghorns (Eng.-Amer.).. (5 birds only. 1 died 18/11/11.	55	114	12	419	856	12	13th
17	S. Smith	Brown Leghorns	50	102	2	395	808	1	18th
18	Mrs. H. H. Bright	White Leghorns (Aust.)....... (4 birds only; 2 died 2/11/11.)	58	110	14	494	932	7	7th
19	N. Cole	Brown Leghorns	48	98	3	446	934	2	6th
20	F. Molteno	White Leghorns (Amer.)	73	134	2	460	848	12	15th
21	C. H. van Breda .	White Leghorns (Aust.)	83	158	12	581	1131	9	2nd
22	Mrs. C. H. van Breda	White Leghorns (Amer.).......	74	142	5	467	906	3	9th
23	S. A. West.......	Brown Leghorns	76	146	0	472	895	0	10th
24	Graham, Hope & Co.	White Wyandottes	96	190	8	444	881	9	12th
25	R. V. R. Jones ...	White Leghorns (Amer.-Aust.).	81	157	12	378	734	8	21st
26	S. Smith	White Leghorns (Dan. & Amer.)	111	212	0	559	1068	12	4th

Replacements (Scores Deducted from Pen Totals).

Pen 3.—No. 17 died. Replaced 23rd October. Score, 68 eggs; weight, 123 ozs. 5 drams.
Pen 4.—No. 22 died. Replaced 4th November. Score, 62 eggs; weight, 110 ozs. 14 drams.
Pen 5.—No. 28 died. Replaced 26th October. Score, 39 eggs; weight, 80 ozs. 14 drams.
Pen 6.—No. 31 replaced 22nd November. Score, 58 eggs; weight, 124 ozs. 11 drams.
Pen 11.—No. 65 died. Replaced 3rd November. Score, 63 eggs; weight, 140 ozs. 10 drams.
Pen 12.—No. 67 died. Replaced 28th September. Score, 38 eggs; weight, 78 ozs. 4 drams.
Pen 16.—No. 96 died. Replaced 23rd October. Score, 71 eggs; weight 160 ozs. 1 dram.
Pen 19.—No. 112 died. Replaced 27th August. Score, 35 eggs; weight, 74 ozs. 10 drams.

Manager's Report for November, 1911.

I regret to have to report that the total number of eggs for this month—1779—as compared with those of September and October, shows a considerable decrease; one of the chief causes of this has been the prevalence of broodiness, with which I shall deal later; a few birds have maintained their reputations fairly well, notably No. 59, but the majority have seen fit to take rests of several days now and then, and in one or two cases all the birds in a pen have done so. Of course, fowls (like ourselves) are apt to get a bit stale and worn out when confined to one place for any length of time.

The highest total in one day was 73, the lowest 51.

The eight pens with the highest totals of eggs are :—No. 26, 111 ; No. 15, 99 ; No. 24, 96 ; No. 11, 84 ; Nos. 6 and 21, 83 each ; No. 10, 82 ; and No. 25, 81.

The highest individual scores in number of eggs are :—No. 89, 27 ; No. 139, 22 ; Nos. 36, 105, 144, and 153, 21 each ; and Nos. 34, 79, 145, 151, and 156, 20 each.

And in weight :—No. 89, 57 ozs. 1 dram ; No. 36, 45 ozs. ; No. 139, 43 ozs. 13 drams ; No. 79, 40 ozs. 10 drams ; No. 144, 40 ozs. 3 drams ; No. 34. 39 ozs. 15 drams ; No. 153, 38 ozs. 12 drams ; No. 156, 38 ozs. 15 drams ; No. 151, 37 ozs. 10 drams ; No. 145, 36 ozs. 10 drams ; No. 105, 36 ozs. 4 drams.

The health of the birds at the commencement of the month left much to be desired, owing to the severe shaking many of them received from the effects of oak-leaf poisoning mentioned in my last report, followed in some cases by enteritis ; and I regret to have to notify the deaths of three birds from this disease during the month, two on the night of 1st November ; these were two of the three in pen 18 which I notified as ill last month, the one which recovered is now laying. The other death from this disease was that of the bird which replaced No. 96 (her death was due to oak-leaf poisoning on 23rd October after an illness of 22 hours) in pen 16 ; and I have little doubt that in this case it was due to the bacillus coccidium enteritis. As we know, " enteritis " is the technical term for inflammation of the intestines, which may be caused by any irritant matter therein, and is not nearly so serious and virulent as that caused by the bacillus. That the coccidium enteritis is present in the soil in large numbers is evident from the number of fowls which die from the effects of its attacks, and also that it can exist for a long period (especially in soil that is at all damp) is very probable ; there is no doubt that a bird whose intestines are brought below par by any cause is more susceptible to its attacks that a healthy one is, or than one with greater recuperative powers and whose phagocytes are of a stronger character.

The birds affected were treated in the usual manner, i.e. by doses of chlorodyne and sweet oil and fed on milk ; but after all the effect of this is only mechanical, the former keeping the intestines at rest and the latter having a demulcent effect and soothing them ; a remedy which is very effective in ordinary enteritis, but in that due to the coccidium enteritis some some antitoxic one is necessary to destroy the bacillus if the phagocytes are unable to do so, and for this purpose salicylic acid (which is a germicide) was added to the milk given to the invalids, and as a preventive to the water supplied to the other birds. Obviously, however, the most reliable remedy and preventive would be one in the form of a culture, similar to vaccine or antitoxin, rendering the bird immune to the disease and curing those affected which have not been injected with it ; and I hope before long to go further into this matter on these lines. I see that a Mr. Casey has been making experiments on the disease at the Durban Zoological Gardens, the result of which will shortly be published and is naturally being looked forward to with much interest. Since the disease made its appearance, the perches, dropping boards, litter, etc., have been daily sprayed with a solution of " Zondo ", these are obviously the only measures that can be taken at present.

One bird died on 5th November from peritonitis and meritis due to a ruptured egg in the oviduct. As she invariably laid a very thin, brittle-shelled egg, which she frequently broke in the nest, I quite expected this to occur sooner or later. Such a bird should always be killed as soon as it is ascertained that she lays an egg of this character. By the way, this demonstrates one of the many advantages of using trap nests.

At the commencement of the month, the tissue round the eye of one bird became slightly swollen (there were no signs of catarrh, bubbles in the eye, nor smell of roup), which was bathed with a warm solution of permanganate of potash, and a dose of epsom salts was administered to the bird, which caused the swelling to subside somewhat, but subsequently it increased in size and I made an exploratory incision and diagnosed a tumour, but of what character it was difficult to say without microscopical examination. Finally as the swelling became much greater and enveloped the whole of the eye the bird was killed on 24th November and the post-mortem revealed a large tumour (judging from a naked-eye examination, a fatty one) completely enclosing the eye and passing through the cranium and commencing to affect the other eye. It has been sent to the Agricultural Department for microscopical examination.

On 10th November we had a fairly strong south-eastern gale, and many of the birds again took their fill of oak leaves, but by washing out the crops and giving a small quantity of mash three times during the day, to which was added linseed oil and bicarbonate of soda, the former to soothe the intestines, the latter to act chemically on the tannic acid and split it up, rendering it innocuous, any very serious effects were nullified. While on this matter of oak leaves, I should like to mention that there seems to be a certain amount of scepticism on the part of some breeders as to the poisonous effects of them. There is no doubt that these when eaten in moderation by the birds have little or no effect, especially in the case of the withered ones, from which the active principle, the tannic acid, has to a great extent disappeared ; but when the young green ones, in which the tannic acid is very active, are swallowed in large quantities, the effect is decidedly of a severe toxic character. An analogy is seen in the case of tea. If we drink a couple or three cups of ordinary tea which

has not been infused for more than four or five minutes, we feel no discomfort, but if we partake of the same or a greater number of cups made from green tea which has been stewed or been infused for some time, I guarantee we should, to put it mildly, feel rather uncomfortable for some hours after.

There have been several cases of feather plucking, this is usually due to the birds having been kept in a small place for some time, to a hot, close atmosphere, to want of exercise and absence of green food. The two first are the only reasons I can give for it, for the birds here have to work in deep litter for every grain they eat and the green food supplied is often left. Two or three weeks' free range is one of the best remedies for this vice that I know, but of course here it is impossible, although it would do the whole of the birds a world of good in every way and augment the egg-yield and—a most important point—lessen the food bill. This is where farmers score. However, flowers of sulphur was added to the mash and also chopped green food, in addition to what the birds always have; and the birds from which feathers were being plucked smeared with a little oil of cloves, and as far as I can judge it has now ceased.

Broodiness has again been very troublesome and on looking through the records of the pens for the month, it will be especially noticed what poor ones have been put up by the heavy breeds (with the exception of pen No. 24, in which only two birds have been broody and were easily broken off). Nearly every one of these birds has been broody, several twice and some three times, at one period every bird in one pen was affected. Seven White Leghorns also were in a similar condition, one on two occasions. In each case, it was difficult to break it off. I haven't much doubt that the closeness of the atmosphere has much to do with it. I can only repeat what I said last month and the month before, every endeavour should be made to breed it out.

At the present time I am glad to say there is no case of sickness among the birds, but it is necessary to be constantly on the watch and certainly the care of the birds lately has not been a sinecure.

During the greater part of the month the weather has been fine and warm, but several days and nights have been very close and oppressive—in all, ten. We have had rain on seven days and on two a strong south-east wind; there were three rather cold nights, but none of these changes were sufficiently sudden or severe to have any undue effect on the egg-yield.

ARTHUR LITTLE,
Manager.

CEDARA.

RESULTS FOR MONTH OF NOVEMBER, 1911.
(Competition commenced 9th July, 1911.)

NOTE. Each Pen consists of four Pullets.

No. of Pen.	Owner.	Breed.	No. of Eggs.	Weight.		Total No. of Eggs.	Total Weight.		Position to date.
				lb.	oz.		lb.	oz.	
1	Mr. Greenough	W.L.	56	7	0½	211	26	6	3rd
2	Mr. Doidge	W.W.	41	6	0	188	23	13	8th
3	Mr. Firmstone	B.O.	13	1	7	207	22	6	4th
4	Mr. Hutt	B.L.	35	3	12	173	17	13	11th
5	Mr. Mason	W.L.	44	4	7½	157	16	10½	13th
6	Mr. Chapman	B.O.	32	3	8½	196	21	13	7th
7	Mr. McEwan	W.L.	52	6	5½	148	18	0	15th
8	Mr. Stranack	W.W.	40	4	13½	196	22	11½	6th
9	Mr. Dewar	S.W.	35	3	11½	186	18	13	10th
10	Mr. J. J. Mann	W.L.	36	4	10	186	23	2	9th
11	Mr. Coupland Ferguson	W.W.	41	4	12½	197	22	4	5th
12	Mr. Guy Blundell	W.L.	50	6	11	219	28	11½	2nd
13	Mr. Woodward	W.L.	21	2	9	136	17	0½	16th
14	Mr. Wilson	B.O.	19	2	6	151	18	10	14th
15	Mr. Wilson	W.L.	6	0	11½	96	12	3	18th
16	Mr. Wilson	B.M.	34	4	8	161	20	6	12th
17	Mr. J. J. Mann	W.W.	62	6	3½	228	23	15	1st
18	Mr. Hulett	W.L.	32	3	12½	133	15	14	17th

EXPLANATION OF BREEDS:

W.L.—White Leghorns.	B.L.—Black Leghorns.
W.W.—White Wyandottes.	S.W.—Silver Wyandottes.
B.O.—Buff Orpingtons.	B.M.—Black Minorcas.

Individual Totals for the Four Months ending 31st October, 1911.

Pen No. 1.

Hen	Eggs
5	33
6	52
7	32
8	38
Total	155

Pen No. 2.

Hen	Eggs.
27	36
28	43
29	36
30	29
Total	144

Pen No. 3.

Hen	Eggs.
63	45
98	39
101	41
141	39
Total	164

Pen No. 4.

Hen	Eggs
1	26
2	44
3	49
4	19
Total	138

Pen No. 5.

Hen	Eggs
113	23
119	36
120	9
173	45
Total	113

Pen No. 6.

Hen	Eggs
125	41
126	40
127	45
129	38
Total	164

Pen No. 7.

Hen	Eggs
44	28
45	22
46	32
47	14
Total	96

Pen No. 8.

Hen	Eggs
49	38
51	37
86	46
108	35
Total	156

Pen No. 9.

Hen	Eggs
31	40
34	39
43	35
62	37
Total	151

Pen No. 10.

Hen	Eggs
25	41
62	35
115	32
118	42
Total	150

Pen No. 11.

Hen	Eggs
14	54
16	55
86	22
107	25
Total	156

Pen No. 12.

Hen	Eggs
10	34
28	34
31	49
32	52
Total	169

Pen No. 13.

Hen	Eggs
35	40
36	33
884	21
890	21
Total	115

Pen No. 14.

Hen	Eggs
20	36
22	4
23	41
24	51
Total	132

Pen No. 15.

Hen.	Eggs
4	34
20	18
24	15
28	23
Total	90

Pen No. 16.

Hen	Eggs
18	27
19	37
21	24
28	39
Total	127

Pen No. 17.

Hen	Eggs
14	45
91	36
125	40
126	45
Total	166

Pen No. 18.

Hen.	Eggs
6	27
12	35
114	24
117	15
Total	101

Maize Export.

RETURN showing quantity of maize exported through various ports during the month of December, 1911.

Province of Origin and Port of Shipment.	White Flat.	Yellow Flat.	White Round.	Yellow Round.	Mixed Flat.	Mixed Round.	Total
	Bags.	Bags.	Bags.	Bags.	Bags.	Bags.	Bags.
EAST LONDON–							
Cape Province ...	1954	951		—	4	—	2909
Transvaal	—	—		—			
Orange Free State...	—	—	—	—	—	—	—
PORT ELIZABETH–							
Transvaal	6708		116		525	10	7359
Orange Free State...	1886		1553	1089	497	63	5088

Agricultural Show Dates, 1912.

CAPE PROVINCE.

Paarl.—Thursday, 25th January.
Stellenbosch. Thursday, 1st February.
Worcester.- Wednesday, 7th February.
Robertson.—Tuesday and Wednesday, 13th and 14th February.
Queenstown.--Tuesday and Wednesday, 20th and 21st February.
Riversdale.—Wednesday. 21st February.
Malmesbury.—Thursday. 22nd February.
Beaufort West.- -Thursday. 22nd February.
Rosebank.—Tuesday. Wednesday. Thursday, and Friday, 27th, 28th, 29th February. and 1st March.
Cathcart.—Wednesday, 28th February.
Graaff-Reinet. Tuesday and Wednesday, 5th and 6th March.
Caledon.—Thursday and Friday, 7th and 8th March.
Middelburg. Thursday, Friday, and Saturday. 7th. 8th. and 9th March.
East London.—Tuesday and Wednesday, 12th and 13th March.
Cradock.—Tuesday and Wednesday, 12th and 13th March.
Bredasdorp.--Wednesday, 13th March.
George.—Wednesday, 13th March.
Bathurst.--Wednesday and Thursday, 13th and 14th March.
Oudtshoorn.—Wednesday and Thursday, 13th and 14th March.
Molteno.--Wednesday and Thurday, 13th and 14th March.
Britstown.- Friday, 15th March.
Somerset East.—Friday and Saturday, 15th and 16th March.
Aliwal North. Tuesday and Wednesday, 19th and 20th March.
Humansdorp. -Thursday and Friday, 21st and 22nd March.
Grahamstown.—Thursday and Friday, 21st and 22nd March.
Barkly East.—Friday and Saturday, 22nd and 23rd March.
Port Elizabeth.—Tuesday, Wednesday, Thursday, and Friday, 26th to 29th March.

NATAL PROVINCE.

Newcastle.—Thursday and Friday, 6th and 7th June.
Vryheid.—Tuesday and Wednesday. 11th and 12th June.
Dundee.—Thursday and Friday, 13th and 14th June.
Klip River (Ladysmith). —Tuesday and Wednesday, 18th and 19th June.
Weenen (Estcourt).—Thursday and Friday, 20th and 21st June.
Umvoti (Greytown).—Thursday and Friday. 20th and 21st June.
Lion's River.—Tuesday. 25th June.
Maritzburg. Thursday, Friday, and Saturday. 27th, 28th, and 29th June
Durban.--Wednesday, Thursday, and Friday, 3rd, 4th, and 5th July.
Lower Umzimkulu (Port Shepstone). -Tuesday. 9th July.
Camperdown.- -Thursday, 11th July.
New Hanover.--Wednesday, 24th July.
Richmond.--Unfixed.
Alexandra County (Umzinto).--Unfixed.
Ixopo.--Unfixed.
Noodsberg Road. Unfixed.

TRANSVAAL PROVINCE.

Middelburg.—Wednesday, 7th February.
Lydenburg.—Wednesday, 7th February.
Bronkhorstspruit.—Wednesday, 14th February.
Bethal.—Thursday, 22nd February.
Wakkerstroom (Amersfoort Branch).—Thursday, 28th February.
Wakkerstroom (Wakkerstroom Branch).—Wednesday, 6th March.
Wakkerstroom (Volksrust Branch). - Wednesday and Thursday. 13th and 14th March.
Johannesburg (Witwatersrand). - Wednesday. Thursday, Friday. and Saturday. 10th to 13th April.
Pretoria.—Tuesday. Wednesday, and Thursday, 16th to 18th April.
Wolmaransstad.— Wednesday, 15th May.

ORANGE FREE STATE PROVINCE.

Smithfield.—Wednesday and Thursday, 14th and 15th February.
Ladybrand.—Wednesday and Thursday, 21st and 22nd February.
Edenburg.—Wednesday and Thursday, 28th and 29th February.
Rouxville.—Wednesday and Thursday, 28th and 29th February.
Wepener.—Wednesday and Thursday, 6th and 7th March.
Bethulie.—Wednesday and Thursday, 6th and 7th March.
Harrismith.—Wednesday and Thursday, 6th and 7th March.
Lindley.—Thursday, 7th March.
Thaba 'Nchu.—Tuesday and Wednesday 12th and 13th March.
Fauresmith and Jagersfontein.—Wednesday and Thursday, 13th and 14th March.
Senekal.—Wednesday and Thursday, 13th and 14th March.
Vrede.—Wednesday and Thursday, 13th and 14th March.
Bethlehem.—Wednesday and Thursday, 20th and 21st March.
Boshof.—Wednesday and Thursday, 20th and 21st March.
Kroonstad.—Tuesday and Wednesday, 26th and 27th March.
Ficksburg.—Tuesday and Wednesday, 26th and 27th March.
Heilbron.—Wednesday and Thursday, 27th and 28th March.
Philippolis.—Wednesday and Thursday, 27th and 28th March.
Winburg.—Wednesday and Thursday, 3rd and 4th April.
Frankfort.—Thursday and Friday, 4th and 5th April.
Bloemfontein.—Tuesday, Wednesday, and Thursday, 16th, 17th, and 18th April.

Farm Employment.

Applicant seeks managership of farm. Life experience in lucerne cultivation, ostrich, sheep, and cattle farming, and agriculture. Has managed farms in Cape Province, Orange Free State, and Transvaal. Married. Testimonials. GEO. J. HITGE, Greystones Farm, P.O. Val Station, District Standerton, Transvaal. [11]

A young man, strong and healthy, 17 years of age, seeks employment on a large progressive farm as an improver with a view of getting a sound practical knowledge of farming. Advertiser speaks both English and Dutch, and has had practical experience as a farm hand for six months. —Apply FARMER, P.O. Box 87, Pretoria. [12]

Young man, 25 years of age, seeks employment as foreman or general working man on a farm. Sober, strong, healthy, not afraid of work. Knowledge of mixed farming; testimonials. Speaks Dutch and English.—G. J. ROSSOUW, c/o H. Vaughan-Williams, Driefontein, Clocolan, O.F.S. [1]

Trades Schools at Pretoria and Johannesburg.

The Pretoria Trades School, established in 1908, and the Johannesburg Trades School, now completed, will have vacancies for pupils at the commencement of the primary school year in January. These institutions are central schools for the trade training of the sons of parents domiciled in the Transvaal; the instruction given is modern in nature and beyond that obtainable in the country tradesman's shop. The course of apprenticeship extends over three years, at the conclusion of which the pupils should be able to obtain employment as improvers with commercial firms.

In order that principals of schools may be in a position to advise parents as to the future of their sons, they are invited to apply to the principal of the Pretoria Trades School, or of the Johannesburg Trades School for particulars, when a pamphlet descriptive of trades schools in general will be forwarded. It should be noted that these trades schools are fee-paying schools, and that wages are not paid to the apprentice pupils. The cost of boarding and lodging pupils has also to be met by parents; in Pretoria the charge is not less than £4 per month. In a few cases boarding bursaries covering about one-half of the cost of boarding may be awarded.

When recommending that boys should be sent to trades schools, teachers are asked to be good enough to note that school ability in addition to a mechanical bent is necessary, as an important part of the tuition given in trades schools is the continuation of the education of the boys in school subjects related to trades, e.g. arithmetic, geometry, and drawing in Standards V, VI, and VII. Boys of a desultory habit of mind or those who have ceased attending school for a year or more should not as a rule be recommended unless there are strong reasons for doing so.

Intending pupils must have satisfactorily passed the fourth standard and be not less than thirteen years of age on entering the trades school.

All communications should be addressed to either of the following:—

Mr. SIDNEY WOOD, B.Sc., C.E., Principal,
The Pretoria Trades School and Polytechnic,
Church Street East, Pretoria.

Mr. A. B. LINSCOTT, A.M.I.C.E., A.M.I.M.E., Principal,
Johannesburg Trades School, Smit Street, Johannesburg.

The Agricultural Journal

OF THE UNION OF SOUTH AFRICA.

Vol. III. FEBRUARY, 1912. No. 2.

Issued MONTHLY in English and Dutch by the Department of Agriculture.

Communications to be addressed to the Editor, Department of Agriculture, Box 434, Pretoria. Telegraphic Address: "Bulletin, Pertoria."

Subscriptions should be posted to the Government Printer, Box 373, Pretoria.

Advertising inquiries should be addressed to the Metropolitan Advertising Co., Box 962, Capetown.

The Transmission of Gall-Sickness by Ticks.

By Dr. A. THEILER, C.M.G., Acting Director of Veterinary Research.

IN this paper I understand under gall-sickness the disease of cattle caused by parasites cf the red corpuscles, which I called "anaplasms", in analogy to the cause of redwater, known as "piroplasms".

In a previous article* I called it gall-sickness of imported cattle, because in our experience imported cattle suffer from it most frequently, and such cattle, when inoculated against this disease and redwater can be turned out to graze without the risk of contracting more diseases than the native Africander cattle would do, thus indicating that these two diseases are the main sources of losses under ordinary conditions. It is almost superfluous to repeat that Africander cattle are also found to suffer from this disease, but attention must be drawn to the fact that not all the diseases called "gall-sickness" are identical with the one under discussion.

The name "anaplasma" is meant to indicate more than a simple analogy to "piroplasma", it should also indicate that these two parasites are somewhat related, although they are a distinct species. This closer relationship exists in the fact that animals which have recovered from an attack of anaplasmosis (gall-sickness) remain permanently infected, and act as reservoirs just as a "redwater immune animal" does with *Piroplasma bigeminum*. Since such close relationship exists between the two, coupled with the fact that the latter is transmitted by the progeny of the blue ticks (i.e. larvae originating from mothers feeding on immune or sick animals) it had rightly to be expected that the anaplasmosis would also be transmitted by ticks, and it remained to demonstrate this surmise by actual experiments.

The first investigations of Kilborne and Smith in connection with Texas fever (which disease embraces both redwater and gall-sickness) showed clearly that the latter disease (which was usually complicated

* *Union Agricultural Journal*, January, 1912: "Gall-Sickness of Imported Cattle and the Protective Inoculation against this Disease."

with the former one) was transmitted by ticks; according to our present knowledge we must conclude that the same batch of the same species of ticks at one and the same time is capable of transmitting the two diseases, the redwater with its shorter incubation time appearing first, and the gall-sickness following at a later date.

The subsequent experiments will show that also in South Africa the same thing happens with our blue tick (*Rhipicephalus boophilus*), and that with this and another species of ticks, the black-pitted tick (*R. simus*), pure infections with anaplasmosis are possible.

I.

EXPERIMENTS TO CONVEY REDWATER AND GALL-SICKNESS INTO A SUSCEPTIBLE ENGLISH HEIFER BY MEANS OF BLUE TICK LARVAE COLLECTED FROM CATTLE IMMUNE TO REDWATER AND GALL-SICKNESS.

Origin of Ticks.—The mother ticks were collected off Africander cattle running on the pasture adjoining the Laboratory, which animals have to be considered to be immune both to redwater and gall-sickness.

Heifer 787.—An imported Sussex heifer had been kept stabled and tick-free since the date of her arrival (20th February, 1909). On 15th May, 1909, this animal was infested with a limited number of blue larvae, the progeny of the above-mentioned adult ticks. Only about 100 larval ticks were placed on the heifer in order to prevent a gross infestation and a resulting severe attack of redwater.

The larvae underwent their usual course of development. On the 11th and 12th days after tick infestation the morning temperature stood at 104° F. and 105° F. respectively, but no parasites were found. The redwater parasites were only found on the 26th day and again on the 48th day.

The parasites of gall-sickness (*Anaplasma marginale*) appeared on the 75th day, infecting on this date 4.5 per cent. of the red corpuscles. They increased daily in number, and amounted on the 86th day to 15.4 per cent. A regular fever reaction ensued from the 85th day onwards, lasting to about the 100th day, during which time the lesions of anaemia became very pronounced. The animal finally recovered.

NOTE.—In this animal we have in the first instance an infection of redwater which was only a slight one; it was succeeded by an infection of gall-sickness (*Anaplasmosis*), having a long incubation period (75 days).

II.

EXPERIMENTS TO CONVEY GALL-SICKNESS INTO ENGLISH HEIFERS IMMUNE TO REDWATER BY MEANS OF TICKS COLLECTED FROM A HEIFER IMMUNE TO REDWATER AND GALL-SICKNESS.

(2) *Heifer* 922.—The following is the history of this animal in England:—

Heifer 922—On 16th October, 1909, this heifer received subcutaneously 10 c.c. of blood from calf 211. The temperature in the morning and evening varied only within physiological limits until the morning of 21st October, when it rose to 105° F. Blood smears taken at this time showed no parasites.

The animal immediately received subcutaneously 1 gramme of trypan blue dissolved in 150 c.c. of water. On the evening of the 21st October the temperature was still 105° F. and the blood smears were negative. On the morning of the 22nd October the temperature had fallen to 102.6° F. In the evening of the same day it was 102° F., and from this time onwards until the 5th November it varied only between 101.2° F. and 102.2° F. Blood smears were examined daily, but no piroplasms could be found until the 28th October, that is to say, twelve days after inoculation and seven days after the rise of temperature. On the morning of the 28th October a very few red-water parasites were present in the blood smears; temperature, 102° F.

No piroplasms were present in the blood smears taken on the 2nd November. A few were found in blood withdrawn on the morning of the 3rd November. They could not be found in the smears of blood withdrawn in the evening of the same day. From that time up to the 5th November the examination of this heifer's blood gave negative results.

NOTE.—Heifer 922 was subsequently exported to South Africa, and arrived at the Laboratory on the 13th December 1909. She was immediately placed in a tick-free stable and temperatured twice daily.

No abnormal records were noted during this observation period.

Treatment.—On the 1st March, 1910 (seventy-seven days after arrival, heifer 922 was infested with a considerable number of blue tick larvae, the mothers of which had been collected off cattle in Natal; the eggs from which the larvae emerged were laid at the Laboratory.

Remarks.—After an incubation time of ten days, a slight reaction occurred, lasting for four days, with a maximum evening record of 104° F. Redwater parasites were noted on one occasion only, and then only in exceedingly rare numbers. Some irregular records were noted subsequently, but all blood examinations proved negative.

On the 55th day a reaction started, lasting for 18 days, with high temperatures in the early part of the reaction (105° F. and over), and averaging between 103°-104° F. during the rest of the time. On the 55th day microscopical examination of the blood showed a very few gall-sickness parasites; they were still rare the following day. Two days later their number had reached 8-9 per cent. The following day a remission was noted to 2.4 per cent.; they were still rare on the 60th day.

On the 61st day they had increased to 18.8 per cent., and they decreased to 16.3 per cent. the following day. Their number now dwindled down again rapidly, and a corresponding remission in the temperature occurred.

The anaplasms had the character of the variety *centrale*, and the anaemic lesions in the blood were in no way marked; the anaemia was characterized by a slight basophilia, which remained for seven days.

Tests.—Heifer 922 was tested subsequently on two occasions with blood of animals which had recovered from gall-sickness, namely, on the 20th May, 1910, when it was injected with 10 c.c. blood of heifer 928 (an animal immune against redwater and anaplasmosis, variety *centrale*) without any results, and again on the 28th June, 1910, no reaction followed the injection of 10 c.c. blood of heifer 934 (an animal immune to anaplasmosis, variety *marginale*).

NOTE.—The infestation of ticks produced a slight temperature reaction during which a very few redwater parasites were seen. After an incubation period of fifty-five days, a distinct reaction started with anaplasms in rare numbers.

(3) *Sussex Heifer* 925.—The following is the history of this animal in England.

On the 16th October, 1909, heifer 925 received subcutaneously 10 c.c. of blood from calf 211. The temperature varied only within physiological limits until the evening of the 21st October when it rose to 103.8° F. Smears, however, were negative. From the 22nd October to the 1st November the redwater parasites were seen in the blood daily.

NOTE.—Heifer 925 arrived at the Laboratory on the 13th December, 1909; she was immediately placed in a tick-free stable and temperatured twice daily.

Treatment.—On the 1st March, 1910—seventy-seven days after arrival—this heifer was infected with blue larval ticks belonging to the same batch as used on heifer 922 (*vide* previous animal); a fairly heavy infestation was made in this instance.

Remarks.—There was a temperature reaction from the 9th day immediately succeeded by a second reaction, but of an irregular character, lasting up to the 30th day. A few redwater parasites were noted on the 12th day only.

A high reaction set in from the 45th day, with evening temperatures reaching 105.8° F., and followed by irregular records. The blood was frequently examined during this period, but, with the exception of a slight anaemia, it was found quite normal.

It was not until the 114th day that another reaction occurred, when a few anaplasms of the type *centrale* were found.

Test.—Heifer 925 was tested on the 8th August with blood of heifer 934, an animal immune to redwater and gall-sickness.

A reaction followed, lasting from the 20th until the 40th day, with exacerbations over 105° F., and during which time anaplasms, variety *marginale,* were found in large numbers for a few days; they then slowly disappeared, corresponding with the fall of the temperature; the symptoms of anaemia were never strongly pronounced, the animal recovering quickly.

The animal was sent to Potchefstroom on the 5th November, 1910, and was still alive on the 31st December, 1911.

NOTE.—In this instance the infestation of ticks produced a reaction during which redwater parasites were noted on one occasion. The irregular reaction was, however, not typical of a redwater infection.

It is possible that the heavy infestation of ticks caused a reinfection with *Piroplasma bigeminum,* from which the animal easily recovered.

In this particular instance the first gall-sickness infection was very slight, and would have passed unnoticed if the examination of the blood had not been continued over a long period. Gall-sickness parasites were found in rare numbers and after a long incubation time of over 100 days. The subsequent injection of blood of heifer 934 (which contained *Anaplasma marginale*) produced a fever reaction accompanied with a large number of parasites.

The Transmission of Gall-Sickness by Ticks.

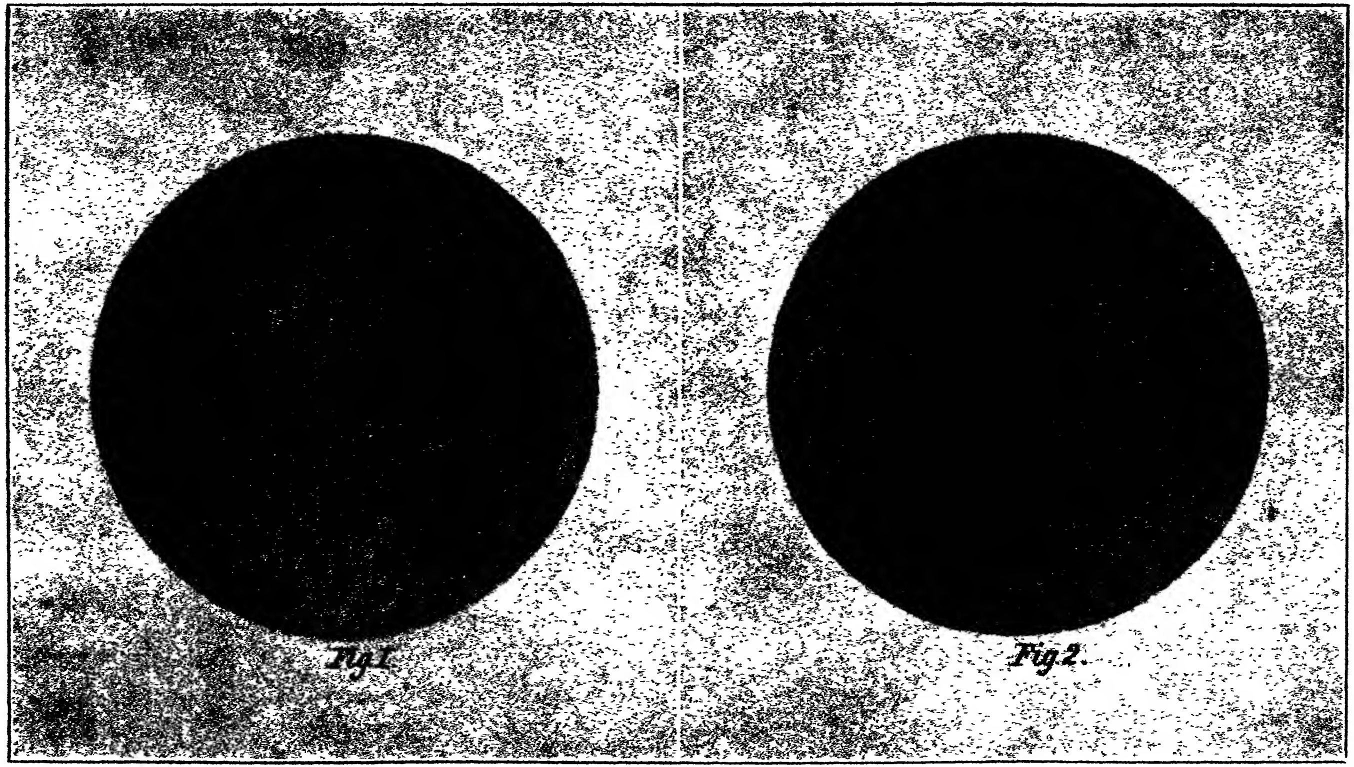


Fig. 1. *Anaplasma marginale.*

Fig. 2. *Anaplasma marginale* (variety *centrale*).

III.

EXPERIMENTS TO CONVEY ANAPLASMOSIS TO CLEAN SUSCEPTIBLE HEIFERS BY MEANS OF BLUE TICKS ORIGINATING FROM A PURE CASE OF ANAPLASMOSIS.

Origin of the Pure Strain of Anaplasmosis.

Heifer 934.—This animal had been used previously, when as a result of the injection of blood 917 it developed the disease due to *Anaplasma marginale*. Later, as the result of a second injection with blood of heifer 926, heifer 934 developed an attack of redwater, it having been clearly shown that gall-sickness was not complicated by redwater.

Accordingly I expected that by infesting this animal, previous to the appearance of redwater parasites, with blue ticks which were free of any infection, they would only become infected with gall-sickness and would then transmit this disease alone.

On the 27th May, 1911, heifer 934 was infested with blue tick larvae collected from heifer 931 (heifer 931 was an English beast which had been infested on the 23rd February, 1910, with blue tick larvae collected from horses; no disease developed in 931 as a result of this infestation, proving that these blue larval ticks were clean).

The infestation of heifer 934 was a fairly heavy one; the engorged females dropped between the 21st and 29th days and were collected in great numbers.

(4) *Africander Calf* 1168.—Born in the Laboratory stables on the 7th November, 1910, and kept tick-free.

Treatment.—Infested on the 12th November, 1910, with the progeny of the blue ticks which had developed on heifer 934, and whose mothers had dropped from the 17th to 24th June, 1910.

Remarks.—Nothing unusual occurred after this infestation. The engorged ticks commenced to drop on the 24th day; the blood was occasionally examined during this time but with negative results.

On the 52nd day a temperature reaction started, continuing for eighteen days. Although this reaction was well marked, with evening records of occasionally 104° F., it could not be called severe.

Gall-sickness parasites appeared with the rise of temperature, being present in the greatest numbers at the onset of the fever, i.e. infesting 3.3 per cent. on the first day, 7.8 per cent. the second day, 4.7 per cent. the fourth day, 3.1 per cent. the fifth day, 2.2 per cent. the sixth day, 1.9 per cent. the seventh day, 1.2 per cent. the eighth day, and remaining at about 1 per cent. throughout the remainder of the reaction.

NOTE.—As was expected in this case, a pure infection of gall-sickness was transmitted by means of the ticks.

In order to prove that calf 1168 was a pure infection, unaccompanied by anything else, the calf was tapped and 5 c.c. of fresh blood was injected into English heifer 1217.

Test of Blood of Calf 1168.

Heifer 1217 arrived at the Laboratory from England on the 9th January, 1911, and was immediately placed in a tick-free stable. The temperature remained within physiological limits during the time of observation.

Treatment.—Injected on the 25th January, 1911 (sixteen days after arrival) with 5 c.c. blood of calf 1168.

Remarks.—A temperature reaction set in from the 22nd day, with evening exacerbations to 105° F. on the 25th and 26th days, and returning to normal on the 31st day; gall-sickness parasites were noted on the 22nd day, increasing in numbers during the succeeding days.

On the 26th and 27th days the lesions of anaemia were noticed. From the 27th until the 44th day anaplasms were found in rare numbers.

Test for Redwater Immunity.

Injected on the 24th April, 1911, with 5 c.c. blood of heifer 1216, an imported heifer belonging to the same batch as 1217, and which developed a pure attack of redwater as the result of the injection of blood of heifer 926 on the 23rd January, 1911.

Remarks.—There was a sharp rise on the 6th day, reaching 104° F. on the 8th day; redwater parasites were noted in fair numbers on the 7th day. The animal was injected with a 1 per cent. solution of trypan blue on the 8th day, and the temperature dropped to normal the following morning.

Conclusions.—The subsequent inoculation experiments prove that the ticks transmitted a pure infection of *Anaplasma marginale* into calf 1168.

(5) *Sussex Heifer* 1218.—An English heifer which arrived at the Laboratory on the 9th January, 1911; she was immediately placed in a tick-free stable and temperatured twice daily. No deviations from a normal record were noted.

Treatment.—Infested on the 25th January, 1911 (sixteen days after arrival), with blue larval ticks from heifer 934.

Remarks.—The adult females were collected from the 21st-28th day in great numbers; there was one sharp rise of temperature to 103.8° F. on the 22nd day, but blood examinations proved negative. Seventy days after infestation a slight but definite reaction, lasting about fifteen days, ensued. Gall-sickness parasites were noted in the blood for the first time on the 70th day and remained present throughout the reaction.

Test for Redwater Immunity.

On the 24th April, 1911 (eighty-nine days after the tick infestation) heifer 1218 was injected with 5 c.c. blood of heifer 1216 (immune to redwater, *vide* previous test).

Remarks.—A temperature reaction set in from the 8th day, and on the following three days microscopical examination of the blood showed the presence of redwater parasites. The animal was injected with trypan blue on the latter date, when the temperature returned to normal and the blood regained its healthy appearance.

Tests of Blood of Heifer 1218.

NOTE.—In order to prove that heifer 1218 was a pure infection of gall-sickness, it was tapped on the 24th April, 1911, and 10 c.c. fresh blood were injected into English heifer 1224.

Heifer 1224 arrived at the Laboratory from England on the 9th January, 1911, and was immediately placed in a tick-free stable. No abnormal temperatures were noted during this observation time.

Treatment.—Injected on the 24th April (105 days after arrival) subcutaneously with 10 c.c. blood of heifer 1218.

Remarks.—On the 18th and following days gall-sickness parasites were detected in the blood, coinciding with the fever reaction which lasted from the 16th to 35th days.

Conclusions.—This case also proves that the ticks transmitted a pure infection of anaplasmosis into heifer 1218.

IV.

EXPERIMENT TO CONVEY ANAPLASMOSIS BY MEANS OF THE BLACK-PITTED TICK.

6. *Sussex Heifer* 930.—This heifer belonged to the same batch as 922 and 925, but had not been treated in England. She arrived at the Laboratory on the 13th December, 1909, and was immediately placed in a tick-free stable. The temperature was taken twice daily, and no abnormal records were noted.

Treatment.—Infected on the 30th March, 1910 (107 days after arrival), with black-pitted larvae, the mothers of which were collected in Natal.

NOTE.—Black-pitted larvae do not readily become attached on cattle, but nevertheless a small number were found hanging to the ears the following day.

Remarks.—Nothing unusual occurred in the temperature until about the 75th day, when a gradual rise was noted, developing into a typical curve, and lasting until the 100th day; the fever was at its height between the 83rd and 92nd days, with evening records reaching 105° F. Gall-sickness parasites appeared with the rise of temperature, increasing and decreasing in numbers corresponding with the course of the fever; counting was not undertaken in this instance.

The symptoms of anaemia appeared on the 86th day.

Nothing further happened with this animal, and in order to prove that it was a pure infection of gall-sickness, it was tapped on the 23rd January, 1911, and 50 c.c. fresh blood was injected into heifer 1213.

Test of Blood of Heifer 930.

Sussex Heifer 1213.—An English heifer which arrived at the Laboratory on the 9th January, 1911, and was kept in a tick-free stable.

Treatment.—Injected as above (fourteen days after arrival).

Remarks.—A severe temperature reaction commenced on the 16th day, with evening rises to over 105° F., and lasting until the 30th day.

During this period gall-sickness parasites appeared in great numbers, and all the symptoms of anaemia developed. The heifer showed visible symptoms of illness, with pale mucous membranes, refused to feed, frequently lay down, showed hurried respirations, and lost condition.

She was treated, and eventually recovered.

Conclusion.—The black-pitted ticks transmitted a pure infection of anaplasmosis to heifer 930, as proved by the injection of a large quantity of its blood into heifer 1213.

Summary of Conclusion.

Five English heifers and one stable-born Africander calf were used for the experiments; they were all susceptible to gall-sickness

(anaplasmosis), two were immune to redwater, having been inoculated against this disease in England.

In all six instances gall-sickness was transmitted. In the first instance both diseases (redwater and gall-sickness) were transmitted to the susceptible heifer by ticks infested with both diseases; in the second instance the ticks transmitted gall-sickness to heifers immune to redwater, and in the third instance ticks were used which originated in the first place from horses, and thereby were freed from any infection of redwater and gall-sickness; these ticks were infected with a pure infection of anaplasmosis, and this pure infection was transmitted to susceptible heifers; the blood of these latter heifers was tested by inoculation, and found to really represent a pure anaplasmosis or gall-sickness infection.

Attention must be drawn to the long incubation time of gall-sickness after tick infection, contrary to a relatively short incubation time after inoculation of the same parasite, of which fact full advantage was taken for inoculation purposes, as indicated in my last article.

This paper should form another illustration of the importance of ticks as a carrier of disease, a disease which attacks practically all cattle born and bred in South Africa, and is responsible for the death of a great number of imported animals. Although I have been able in my previous article to show that it is possible to inoculate against this disease, and thus convey a great amount of immunity, so that such inoculation may be made use of for practical purposes, yet I do not consider that such inoculation is the solution of the problem under discussion. The destruction of the ticks will get at the root of this evil, and the foregoing notes may be considered as a further support of our recommendation for the destruction of all tick life.

Scab: Its Nature and Treatment.

By A. G. Davison, Principal Inspector of Sheep.*

Nature.

Scab is a contagious disease of the skin, characterized by irritation and intense itching. It is essentially a parasitic disease, its sole originating cause being the presence of small insects or mites called acari. There are many varieties of the parasite, but we need only deal with those with which we are familiar in this country. These varieties are the psoroptic, sarcoptic, and symbiotic.

Sheep are liable to the attacks of the two first-mentioned species, the psoroptic and the sarcoptic, but that most generally known among farmers is the psoroptic. This parasite is one of the larger mites, and can readily be distinguished with the naked eye. The adult female is about one-fortieth of an inch long and one-sixtieth of an inch broad. The male is slightly smaller than the female, being about one-fiftieth of an inch long and one-eightieth of an inch broad.

The parasites are furnished with sharp mandibles which are used, not for burrowing (for the mite is always found on the surface either on the skin or in the wool), but for piercing the skin of the animal to obtain its food. Their bites are followed by intense itching with irritation, and papules of a pale greenish colour are formed, from which there exudes a serous fluid, and this becoming dry and hardened, forms a yellow crust or scab. The pimples, though isolated at first, soon become confluent through the multiplication of the parasites. The inflammation raised by the constant rubbing and scratching, in the attempts of the animal to allay the irritation, causes a great amount of purulent fluid to exude, which upon drying increases the thickness of the crusts. The skin soon becomes too hardened for the mandibles of the parasite to penetrate, and the mites consequently forsake the centre and extend round the margin. Thus the spot of scab, unless checked, increases in size, and in time extends to all parts of the body.

The first indication of the presence of scab in sheep is itchiness; the animal will be observed to bite, scratch, or rub itself; dirty stains will be observed on the wool on those parts which can be reached by the hind feet, such as the shoulders and neck. In some cases the points of the wool will appear dead or flattened, whilst in others the fleece will be "flowery"—that is, tags or tufts of wool will hang from the places at which the animal has bitten in its attempt to allay the irritation.

If the sheep is caught, the patch of scab located, and the infected place rubbed or scratched with the fingers, the animal will extend its head and neck and move its lips and jaws with a convulsive

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* This article was first published in the *South African Agricultural Journal*, June, 1911, and is now reprinted with additions.

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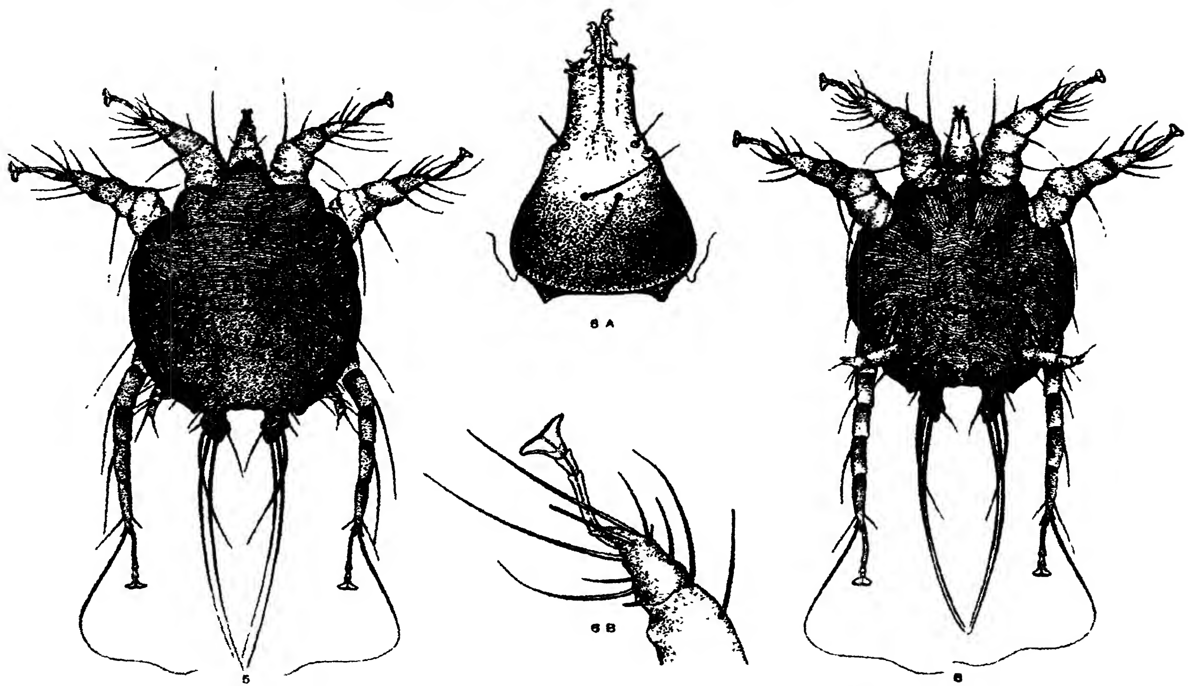

Fig. 5. Adult male parasite of common sheep scab. dorsal view. Fig 6. Ventral view of same. Fig. 6 A. Head of female. Fig. 6 B. Leg of female. (All greatly enlarged.)

(From Bulletin No. 21, United States Bureau of Animal Industry.)

snapping motion indicative of the most exciting pleasure at the operation. In the early stages of the disease, if the wool be parted at the infected spot and the skin examined, a small pimple or pimples of an unhealthy colour will be observed and the parasite will be discovered either on the skin or in the wool surrounding the affected part. The acari can easily be distinguished by its shiny appearance with the naked eye or by the aid of a magnifying glass. If the spot of scab be of any size and the surface of the skin is covered with a hard scab the parasite should always be sought for on the margin of the infected place, for as the scab increases the acari always move to the healthier and softer part of the skin for sustenance.

Sheep may bite, scratch, or rub from other causes than scab—for instance, the sheep louse (ked) causes intense irritation to the animal which it infests. The bites of the ked cause the sheep to tear at the wool and scratch to such an extent that, at times, experienced farmers will believe their flocks to be infected with scab until the animals are caught and properly examined, when the cause of the irritation is at once apparent. Ticks and grass seeds are also responsible for great irritation, but in every case the cause is at once evident when a careful examination is made.

Inflammation of the sebaceous glands may also, at a cursory glance, be mistaken for scab, for it produces severe itching; the skin is red and sensitive, and is covered with yellowish, viscid yolk. The wool is torn out and hangs in tufts where the sheep have bitten and scratched, but upon the animal being handled it will at once be seen that the trouble is not due to the scab parasite.

Experiments have proved that the female mite lays from fifteen to twenty-four eggs either on the skin or fastened on the wool near the skin; a six-legged larva is hatched, and these larvae will moult when three or four days old. After the first moult the fourth pair of legs appear, at which time the mites are two-thirds the size of the adult. When from seven to eight days old the mites are mature and ready to pair; several (three or four) days are allowed for pairing. After pairing a second moult takes place, followed immediately by a third moult; then eggs are laid and the adult parasite dies. Opinions differ respecting the period required for the eggs to incubate which may probably be explained by the conditions under which the observations and experiments were made.

Some writers maintain that the larvae will appear in from three to four days after the eggs have been laid, while others again estimate the period of hatching at from six to seven days. Much must, however, depend on the climatic conditions, for in this country the egg of the parasite has been known to hatch in thirty-six hours after it was laid. Experiments carried out some years ago showed that on the sixth day after three adult parasites had been placed on a clean sheep, several larvae were observed on the infected spot. It will, however, be readily perceived that in favourable conditions the parasites can increase at an enormous rate, especially as the females outnumber the males in the proportion of two and even three to one. Allowing the procreative faculties to be in operation when the acari are fifteen days old, which is understated, it has been estimated that the increase from one pair in three months would be about 1,500,000.

Sarcoptic scabies.—These parasites are much smaller than those of the psoroptic variety, and are almost invisible to the naked eye

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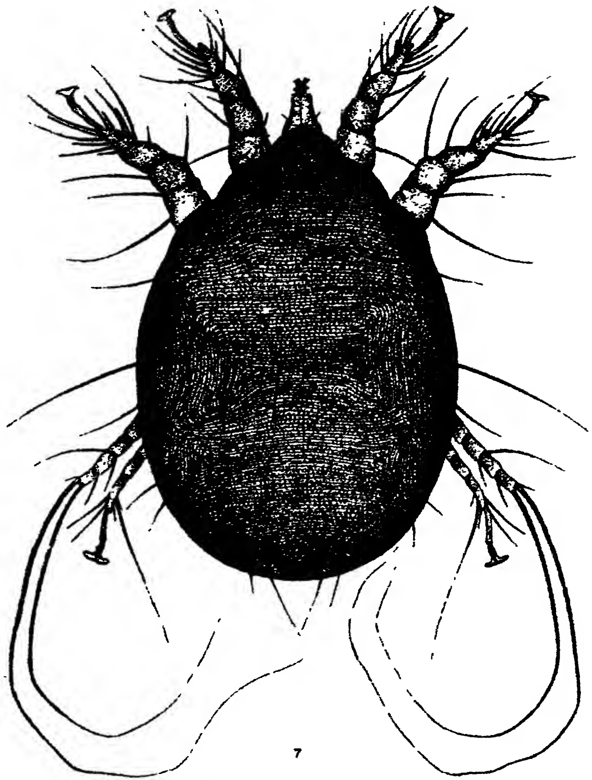

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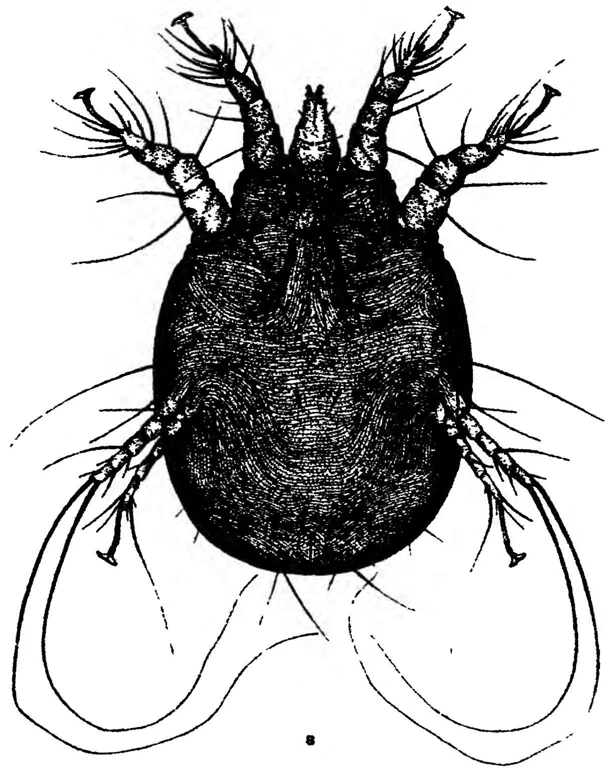

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Fig. 7. Adult female parasite of common sheep scab, dorsal view. Fig. 8. Ventral view of same. (Both greatly enlarged.) (*From Bulletin No. 21, United States Bureau of Animal Industry.*)

except when the acari are in motion. They are found under the epidermis, and live on the fluids of the sheep. Fortunately in this country this species of scab is rare among sheep. It appears on the parts of the body where wool is scarce, usually beginning about the nostrils and on the upper lip; it spreads in time to the cheeks, eyelids, forehead, ears, and under the jaws. In some cases the disease extends to the belly, front legs, knees, hocks, and pasterns. Experiments have proved that the sarcoptic acari taken from an infected sheep will infect a common goat, for in one instance a portion of the skin taken from a sheep suffering from sarcoptic scab was attached to a healthy goat, with the result that on the fifth day papules were clearly visible and the scab continued to spread until the larger portion of the body was covered with a hard white crust.

The sarcoptes are parasites, which burrow under the skin. In shape they are smaller than the psoroptes, and of a less oval form, whilst the head is short and thick. On account of their burrowing habits, and the fact that the female deposits her eggs in the furrows she has made, as well as by reason of the parts of the animal usually attacked, the disease is more difficult to cure than the psoroptic scab, and will only yield to continuous and systematic treatment.

Angora as well as common goats are subject to sarcoptic scab. The parasite first atacks that part of the skin which is free from hair, and then if unchecked spreads to all parts of the body; the skin becomes hardened, dry, cracked, and adherent, and the nose and lips tumified, until the unfortunate animal becomes encased in what might be termed a complete suit of armour, with this difference, that instead of protecting the body the scab ultimately causes death.

Pigs, cattle, dogs, and horses are at times attacked by the sarcoptic scab, and many outbreaks of the disease may be attributed to sheep and goats frequenting places in which such infected animals have slept.

Angora goats, besides suffering from sarcoptic scab are also liable to be attacked by the symbiotic species. These parasites generally commence operations on the inside of the front and hind legs, the chest and abdomen are also attacked, and then the sides of the animal. The mites congregate in immense numbers, and may readily be observed with the naked eye on the margin of the infected spots. Their movements are rapid, and the males appear to be almost as numerous as the females.

The sarcoptic variety spreads more rapidly than the psoroptic, but the latter genus of acari cause more intense itching than either of the other genera. This fact is well illustrated by the more intense irritation which characterizes the scab of sheep in comparison with the scab of goats.

Treatment.

The primary consideration in the treatment of scab is the destruction of the acari, which are its originating cause. The next point to attend to is to effect their destruction with as little injury to the animal or its fleece as practicable; and last, but not least, in these times of keen competition, to accomplish these objects as economically as possible. One of the most important appliances on every farm on which small stock are grazed is the sheep-dipping tank. As a rule there are two different forms of tanks at present in use, viz., the long, narrow tank and that of a circular shape. The most suitable for the

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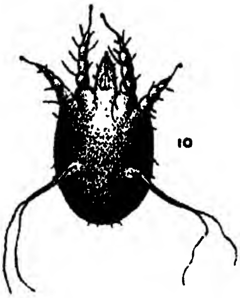

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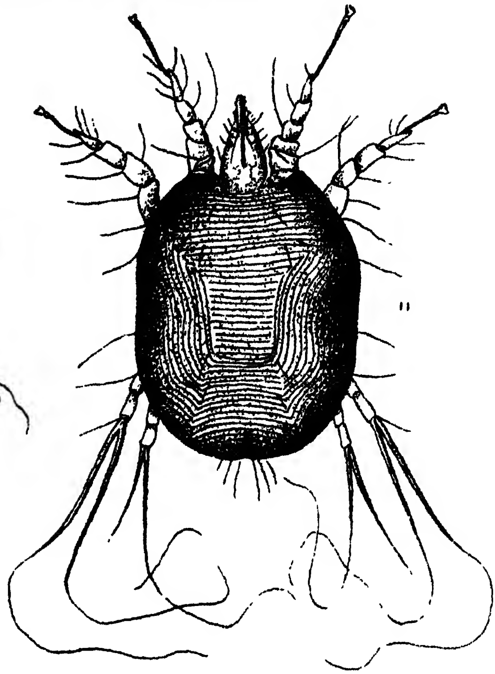

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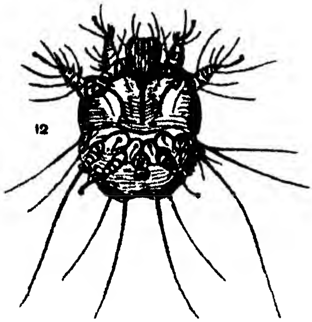

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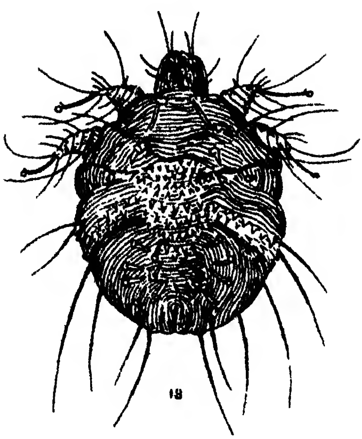

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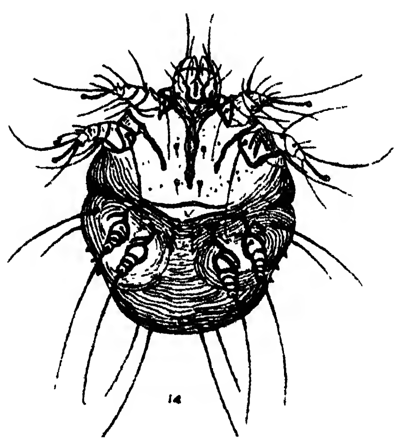

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Fig. 9. Egg of mite which causes common sheep scab. Fig 10. Six-legged stage of sheep scab mite. Fig. 11. Young female before moulting for the last time, dorsal view. Fig. 12. Adult male parasite of sarcoptic scabies of man (the corresponding parasite of sheep is very similar), ventral view, × 250 (after Blanchard). Fig. 13. Adult female parasite of sarcoptic scabies, dorsal view, × 250 (after Blanchard). Fig. 14. Same, ventral view (after Blanchard). (All greatly enlarged.)

(*From Bulletin No.* 21, *United States Bureau of Animal Industry.*)

modern farmer is, however, the last mentioned, constructed without a pillar in the centre, and nearly in the form of a large soap pot. For the ordinary farmer the following dimensions will be found useful, viz.:—Diameter at top, 4 ft. 6 in.; diameter 9 in. from surface, 5 ft.; diameter 12 in. from the bottom, 3 ft. 6 in.; depth of the tank, 5 ft.

The bottom of the tank should be gradually rounded off, and the whole lined with cement. The object in building the tank with a slightly smaller diameter at the top than nine inches from the surface is to prevent an overflow when sheep are placed in the water. A tank of the aforementioned dimensions would hold from 400 to 450 gallons of water, which should be sufficient for all ordinary requirements. The advantages of a circular tank, as compared with a long, narrow tank, will be found in the thorough soaking of every animal treated in the first-mentioned tank. Each sheep or goat placed in the water must swim round and round until released into the draining kraal. The action of swimming opens the fleece and thus allows the dipping mixture to penetrate to every part of the body. In the long narrow tank, the animals have to be frequently turned over, and they are continually crowding at the outlet, climbing one on top of the other in their efforts to escape. Some sheep may be thoroughly saturated, whilst others again frequently leave the tank apparently wet, but in reality with parts of the skin (generally about the shoulder) almost, if not quite, dry. In the case of sheep with long fleeces, the wool compressed against the skin, owing to the crowding of the animals in the tank, acts in a great measure as a hindrance to the dipping mixture penetrating to the skin. The labour entailed when dipping in the circular tank is infinitely less than when the long tank is used. There is far less waste of dipping material, and the results are much more effective.

When selecting a sheep dip it is well to remember that two properties are essential in order to secure the most beneficial results. First, the preparation should prove a perfect cure, and second, it should act as a preventive to reinfection. Having selected the dipping ingredients, no mistake must be made as to the manner in which these should be prepared, which must be strictly in accordance with the directions given, and wherever possible the preparation should be used in a warm state. Guess work must be avoided, for this in a large measure is accountable for many of the failures to cure scab. Every gallon of water should be carefully measured when thrown into the tank, and a gauging rod should be kept, showing the graduated capacity for every twenty-five or fifty gallons contained in the tank.

We now pass on to the actual dipping, and at this point, it is well to observe that before placing any sheep in the tank, every animal showing the slightest symptoms of infection should be caught, and all the scabby parts thoroughly softened and broken up by hand with the aid of some of the dipping mixture taken from the tank. If any sheep are infected with sarcoptic scab, these animals should receive the most careful handling, especially when the head is affected. The handling of all scabby animals prior to the dipping is most important, for experience has proved that the ova of the parasite, hidden under the hard covering of scab, may retain their vitality for many months, unless the dipping mixture is allowed to penetrate to every portion of the skin. When placing the sheep in the tank care must be taken that each animal is caught in a proper manner, and neither dragged along the ground nor pulled to the tank by its hind leg. Such actions

frequently cause ewes heavy in lamb to abort, and may at the same time be responsible for other serious injuries. The sheep must be dropped, not thrown, into the water, and each animal when being immersed should be able to see where it is being placed. It is essential that every farmer should be provided with a sand-glass, timed to two minutes, and no sheep should be allowed to leave the tank until the sand-glass has run its course.

If any sheep in the flock are in low condition, these animals should be dipped before the remainder of the flock, and at the same time assisted by hand to leave the tank. In cold weather, operations should be commenced at an early hour, and all work suspended at noon in order that the fleeces of the sheep may dry before sunset.

The first dipping having been completed, the flock must be given a new kraal or sleeping place, and the old premises destroyed by fire, or enclosed with a substantial fence. Wherever possible, fresh pasture is also advisable.

The first dipping, if properly administered, only destroys the living parasites, and does not injure the eggs of the mites, which will probably continue to hatch for some days after the operation.

No doubt many of the larvae will die from the effects of the first dipping, as the fleece, as well as the skin of the sheep, will still be impregnated with the dipping mixture. Still a considerable portion may survive, and in order to deal with these a second dipping must be administered within a certain period. The interval which should elapse between the two operations is a matter of opinion, and has been variously estimated at from ten to sixteen days.

In this respect much must depend on the climate as well as the ingredients used for dipping, for a preparation which contains a considerable proportion of sulphur will probably carry with it more lasting effects than any other mixture. Experience has shown that the second dipping should be carried out at an interval of from ten to fourteen days after the first operation, although in the cases mentioned there should be little or no danger if the second dipping is postponed to the sixteenth day.

If dipping is carried out on the lines here laid down, and the stock kept away from the old kraals, or other sources of infection, they should be cleansed and will remain clean unless the parasite is introduced from some other quarter.

The stock and farm having been cleansed, it is of the greatest importance that every precaution should be taken to guard against reinfection. In this respect farmers cannot be too careful regarding the treatment of any small stock which may be brought to the farm. It is imperative that only clean sheep should be introduced, and that these should be thoroughly dipped as a precautionary measure before being mixed with the other stock on the place.

Experiments have shown that when separated from its host the scab mite will not live for more than three weeks. Parasites taken from an infected sheep, placed in wool, and kept in dry, loose kraal manure, had all died save one on the thirteenth day, and the sole survivor shared the same fate on the sixteenth day. By keeping the wool moist, the acari placed in it have been known to remain alive for twenty-one days. If exposed to the cold the mites become dormant, but if warmed either in the sun or beside a fire they will regain their vitality, provided they have not been separated from their host for more than three weeks. As has been already mentioned, the

ova of the parasites may hatch in a few days after being deposited by the female mite. It is, however, quite possible for them to remain inert for a considerable time and yet be capable of germinating when proper conditions of heat and moisture are supplied. In this respect, it is well to remember that kraals and other premises in which infected sheep or goats have been kept, will, unless properly treated, constitute a source of danger to clean stock for a long period after being altogether abandoned. As the parasite cannot live for more than three weeks when separated from its host, the only conclusion to be drawn is that in kraals of this description it must be the ova of the mite which retains its vitality.

Experiments conducted with the object of ascertaining for what length of time a kraal, when abandoned, could be deemed a source of infection, have proved that even after three years such a kraal still retained the germs of infection.

The kraal in question was enclosed on the 11th August, 1906, in such a manner that no small stock could possibly trespass in it. On the 10th August, 1909, the said kraal was opened and 100 goats selected from a flock numbering 780 goats (which had never had scab) were allowed to sleep in the kraal every night. On the 30th September following scab appeared among the experimental goats, whilst the control flock remained clean.

Scab is a disease neither difficult to cure nor eradicate, an accurate knowledge of the cause, as well as the necessary treatment required is essential to success.

An impression exists among some farmers that scab is hereditary, and that a lamb born from a scab-infected mother may also be affected with the disease. This impression is, however, erroneous, for the parasite which causes scab lives on the external surface of the body and does not reach the womb. Lambs are occasionally born with white spots on their skin, due to the absence of yolk on these particular places, and this has possibly given rise to the idea that scab is hereditary.

On the Australian Continent there at one time existed a condition of affairs similar in many respects to that which we in this country have to contend against. Many farmers held most erroneous views on the question of scab. The Governments of the various Colonies, believing that scab could be eradicated, enforced the laws for the administration of the disease with a firm hand, and they achieved the following results:—

In Queensland scab was eradicated in 1864, in New South Wales in 1868, in South Australia in 1871, in Victoria in 1876, in Tasmania in 1879, and lastly in Western Australia on the 26th of May, 1898.

Surely if other colonies suffering from the same drawbacks as we do can effect results of this nature we can follow their example.

Let it always be remembered that half measures are not merely disappointing, but they are the most expensive, because anything short of complete success means complete failure.

Notes on the Orange in California, August, 1911.

By R. A. Davis, Government Horticulturist (Transvaal).

These notes were collected from personal observation as far as all particulars with regard to actual culture of the citrus family and its general commercial handling are concerned. Statistics with regard to shipments of fruit to the eastern States and Europe through the California Fruit Exchange, together with information *re* co-operative marketing, were kindly supplied by the various officials in Los Angeles connected with the Exchange, or by Mr. Harold Powell, secretary of the Citrus Protective League. They have a direct bearing on the budding citrus industry of South Africa in that, although actual orchard practice such as one finds in our best tended groves is little behind that which exists in California, we may learn a very great deal by studying their methods of handling the crop from the moment it is gathered from the tree. It is here that we are in the greatest need of help.

To begin at the beginning, one finds that oranges are budded (and not grafted, under any circumstances) on either sweet or sour stocks, the latter being more generally in demand. Bitter Seville is the favourite, but, in addition, Florida sour and rough lemon are used. Neither of these is as susceptible to gum disease as is the sweet orange stock, and it is somewhat surprising to find that quite a large number of trees worked on this root are produced and sold annually. There exists a belief that certain soils are better suited to sweet stocks, and that in such soils gum disease will not appear. This does not seem to be borne out by facts, for the writer saw hundreds of seedling trees and others grafted on sweet stocks in the last stage of gum disease.

The growing of the trees in the nursery is conducted on the most careful lines. Each tree is staked and trained to a single stem only. From the time the young buds have a few leaves until the tree is about 3 feet high and the time for heading back comes, the appearance of each new leaf is the occasion for a raffia ligature; thus a young nursery tree appears to be bound to the stake every couple of inches. Such work calls for a very large amount of labour, and during the growing periods it is customary to see many white youths and men busily engaged at this work. A good Washington Navel tree sells at 3s., whilst extra fine ones fetch 4s. and 5s. each. They are almost in every case sent out from the nurseries "balled", that is, with a ball of earth round the roots. This system requires the trees to be planted a little further apart in the rows than usual, but is found quite satisfactory. Trees removed with care, set in a shady place and watered, scarcely wilt; they will travel well for long distances, and as the ball of earth, tied up in sacking to keep it a compact mass,

weighs much less than a paraffin tin full of soil does, this method is suggested to our nurserymen for trial.

Planting.—Orange trees sent out in this way may be planted without removal of the sack; with the addition of the water which is indispensable at planting time the canvas soon rots. It was noticeable that shallow planting has many adherents, and there is no doubt but that citrus trees of all kinds are more satisfactory and less liable to gum disease when set out in this way. The bud should be at least 6 in. above the level of the ground after it is set.

Training.—Systems differ just as much in California as they do in South Africa with regard to the training of young orange trees. Some orchards were seen where the old system of allowing the branches to sweep the ground is still adhered to; various reasons were given for permitting this with which most readers are familiar, but the main factor in allowing a young tree to grow up in this way proved to be that larger returns were secured in the earlier stages of growth. Thus a four-year-old tree is expected to yield a box of oranges, whilst under the system of trimming the limbs higher and keeping them off the ground, less fruit would be secured. In many cases the lower limbs had been allowed to come down until the tree was six or seven years old, but after that age they had been removed and the tree encouraged to assume the correct shape, that is, well branched and perfectly balanced, with the lowest outside limbs trimmed so that no leaves come within 18 in. of the ground. It is a question whether it pays to get every possible penny of income out of a tree by encouraging heavy bearing in its youth, but there are undoubtedly occasions where immediate income appears of paramount importance, and this will probably always be so.

Pruning.—Many groves appear to have had very little done, and, indeed, the orange does not require as much attention in this direction as most trees. The practice generally observed is to clean out all small dead wood in the inside of the tree, together with all suckers or water sprouts with any branches which may appear superfluous.

Fruiting in the interior of the tree is encouraged, and to accomplish this it is necessary that branches should be fewer than formerly when the idea prevailed that an orange tree should present a dense wall of foliage from top to bottom.

Most of the pruning is done from inside the tree; that is, the workman does not stand outside as in ordinary pruning, but ensconces himself amongst the branches where, in the case of large trees, he is completely hidden, and effects the necessary thinning, etc. In some instances the prunings are allowed to accumulate under the trees for two or three years before they are removed, but this only happens where the branches of the trees sweep the ground and so hide the unsightly heaps, which can do no good and only serve as a breeding-place for insects.

Soils and Climate.—In very few instances did the writer see anything as good for orange culture as are to be found in South Africa. The rich, deep, red loams which abound here are comparatively few and hard to find. On the other hand many thousands of trees are planted and thriving in grey loam of varying depth. Occasionally one finds an excess of lime has injured the trees—an occurrence not likely to happen in South Africa. Naturally, the orchards cling to the foothills on account of the warmth

secured. In favoured districts, such as Lindsay and Porterville, there is a tendency to plant lower down in the valleys. Although in many orange-growing portions of the State summer temperature is exceedingly high and the sun so fierce as sometimes to injure the oranges, in winter there is scarcely any portion of the country where pineapples and bananas can be grown commercially on account of the low night temperature prevailing. Thus in some districts preparations are made well in advance of winter for raising the temperature in the groves by means of fires and so saving a crop. It is hardly necessary to point out that this is quite a costly proceeding, and it should emphasize the necessity of planting only on a site which is free or nearly so from frost. Rainfall takes place during the winter months and may be, in the southern citrus belt, anything under 18 inches, very rarely over, and occasionally less than 10. This renders irrigation

Irrigation Methods in California.

a necessity, and the provisions for it are very complete. Water is obtained, generally speaking, either from a furrow owned by an irrigation canal company, which disposes of water at so much per acre per annum, or by means of pumping.

In those districts which have no water-furrow, of course the pump is resorted to, and in most cases all groves of twenty acres and over have their own pumping station. Boreholes are put down, generally of eight inches in diameter, and a powerful pump installed; those in use are nearly all plunger pumps, the centrifugal being almost entirely displaced by them. Electric power is obtained from some one of the many power companies at a moderate cost. It will be seen how comparatively simple the water question is in California as compared with our own.

An excellent system of irrigation is in vogue at Lindsay, where pumping is general. The water is pumped up into a small wood or cement reservoir fixed some 6 ft. above the highest level of the ground. From there it is conducted by gravitation through a cement pipe-line placed some 15 in. under the surface. These pipes vary from 12 to 18 in. in diameter, according to requirements. Between every alternate row of trees a smaller cement pipe connects vertically with the large one below ground, and the water is admitted into this by a valve easily turned by hand. In these vertical pipes are four holes, each 1 in. in diameter, and through these the water is allowed to start on its beneficial career.

This is almost as perfect a system for the delivery of water as can be devised—it admits of exact measurement, and either slow or quick flow as required. It is distributed amongst the trees by either what is known as the furrow or the check system, the former being mostly used. Furrows are made mostly by the addition of a furrowing attachment to a cultivator frame, and a "furrower" was secured for use at one of the experimental stations, where it will also demonstrate its suitability for the purpose to farmers and other visitors.

The natural sequence to irrigation is cultivation, and here the mode adopted was most perfect.

As soon as a team could get on the land, the sloping-toothed harrow was called into use; this made a good job of the levelling, although there is an implement which does better work, having been specially designed for the purpose. (One of these was also purchased for a South African grower.) In order to defer the next irrigation as long as possible, the cultivator is then employed. Evaporation, however, is extremely rapid, owing to the intense heat of the sun, consequently irrigation is resorted to more frequently than is generally the case here. Cutaway harrows are generally favoured.

Fertilizing.—Cover crops of some kind of legume, principally beans, are in general use in order to afford a supply of humus and nitrogen. The latter is also applied in the form of nitrate of soda and dried blood—the former of these has largely displaced sulphate of ammonia as a source of nitrogen. It acts quickly, whereas the dried blood gets more slowly to work. The sulphate of potash is almost exclusively resorted to for a supply of this material, whilst steamed bones are favoured as yielding phosphoric acid and a certain amount of nitrogen also.

Experiments are being conducted at the University of California, Southern Experimental Station, for the purpose of deciding what fertilizers are best suited to Californian soils, but as the latter vary as much as our own, it is apparent that no one formula can be laid down as being par excellence the correct thing to use.

It is customary with the majority of growers to use a large supply of fertilizer annually, as much as £15 to £20 per acre being freely spent; it is therefore a matter of the first importance that no mistake be made in the application of any one ingredient which may be unnecessary, and it will be seen that a properly balanced formula is of the utmost importance.

It must be conceded that California fruit growers conduct their operations on strictly business lines, so that the expenditure named must be justified by results before it would be so regularly undertaken. That this is undoubtedly the case is borne out by the prices obtained

Interior of Orange Packing House, California.

for both unimproved land and bearing groves. Near Lindsay, land suitable for orange growing is worth and realizes from £80 to £110 per acre; there are no facilities for watering, and boring must be resorted to.

Just previous to the writer's visit, the following transactions took place. One orchard of Washington Navel oranges, six years old, sold for £320 per acre; one of eight years for £400, and a little 5-acre plot of Thompson's Improved Navel, 6 years old, fetched £240 per acre.

Varieties of oranges planted now are almost entirely confined to Washington Navel or Valencia Late. Occasionally one finds other types of Navel, such as Thompson's Improved or Navelencia, but the original Navel is par excellence the one to plant. A good many old seedling groves are still found dotted about the country, but the fruit from these realizes comparatively low prices as against the varieties named.

During August a few packing houses were still running on Valencia Lates, and a good many orchards were seen where the fruit was still hanging. As this month corresponds with February here, it will be seen that this was exceedingly late, and the trees were none the better for their long-sustained burden. The fruit, too, had not the juice or flavour which it possessed earlier in the season. However, prices were high, and as long as they hold, there will be no difficulty in finding growers to pick late even should their trees suffer.

Insect Pests and Diseases.—California can boast of even more insect pests affecting the orange than South Africa. It possesses all the species present here and others besides. During the writer's visit a campaign was being waged against the Orange Thrip, which has done much damage recently. It attacks both young, tender foliage and fruit. The U.S. Agricultural Department had detailed an entomologist to deal specially with this pest, and under him was working one of the students sent by the late Transvaal Government to Cornell University. As previously stated, gum disease is extremely prevalent.

Gathering the Crop.—This is done usually by gangs of men who put in an appearance annually at ripening time. If a good understanding exists between employer and employed, it is common for a gang to work for the same employer year after year. Each man is paid at the rate of 10s. per day of ten hours, and although this may seem, and really is, a high rate of pay for work generally regarded as simple, it is more profitable to the grower than the employment of inferior labour. Sometimes picking is done on contract, but this is not as a rule satisfactory.

Without exception, each man uses gloves for picking. These may be of canvas or other suitable material, and are quite cheap. The fruit is put carefully into a bag carried by the picker, and thence into an orchard box. (Samples of these gloves and bags were purchased, and may be inspected at the Office of the Government Horticulturist, 63 Tudor Buildings, Pretoria; they can be made in South Africa just as easily as in California.)

The practice of allowing oranges to remain in the boxes three or four days before packing is not now as general as it was. In most instances the earlier fruits are "sweated" or "cured" in this way because at that period the skins are harder, and a little wilting makes

packing easier. As the season advances, and the oranges get riper and softer, the need of curing disappears, and it is customary to pack as soon after the fruit has been delivered to the packing-house as possible. It is found that oranges arrive at their destination in quite as good order this way as when they have been "cured".

The most extreme care is necessary in handling oranges for distant shipment, and this has been recognized to the full by growers there, who spare no pains to ensure the safe arrival of their fruit in the markets of the eastern States and Europe. It is this very factor that has made the citrus industry in California the success it is to-day, and it is by the exercise of similar care and *by that means only* that South Africa can attain a like success.

From the orchard the fruit is hauled in orchard boxes to the packing-house of the association of which the grower may be a member, or to that perhaps of some packer who has purchased the fruit.

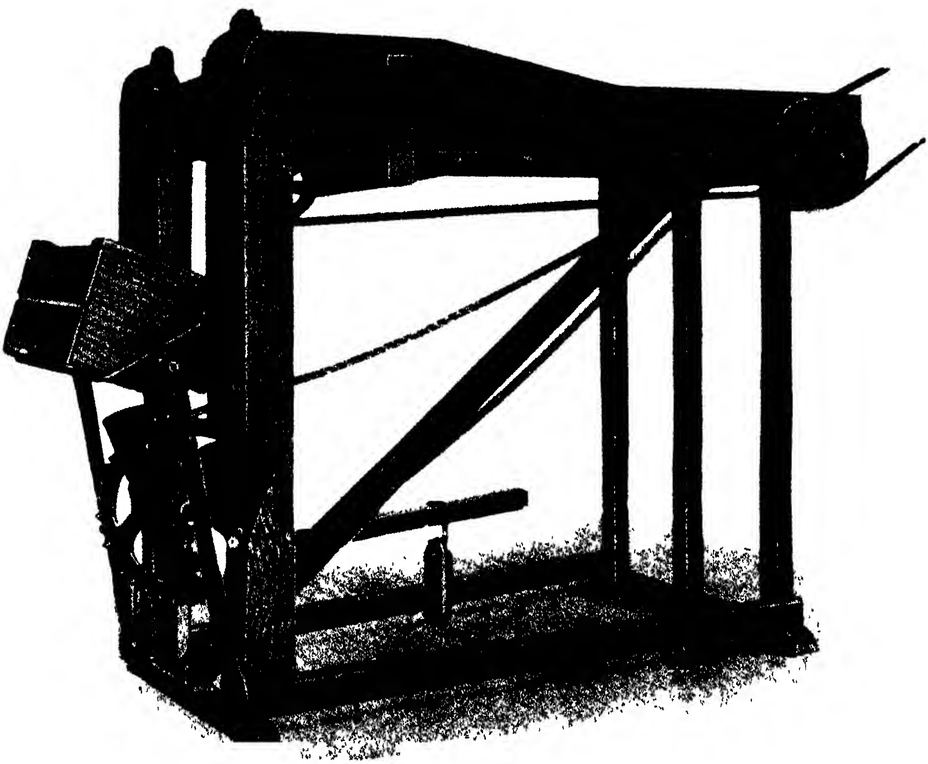


Fig. 1. Automatic Elevating Dumper and Feeder.

Packing-house appliances as used to-day are nearing perfection, and some idea may be gained of what they are like from the accompanying illustrations.

The boxes of fruit are off-loaded from the wagons and placed in the carrier shown in Fig. 1; this automatically raises them slowly to the level of the feeder on which they are "dumped" quite gently and carried by means of revolving wooden rollers to the sorting table. Here they pass under the scrutiny of the sorters, who reject any unfit

specimens, and are then carried on the rollers to the sizing machines. There are many of these in use; the best type seen by the writer was called "The Independent Roller Sizer" (Fig. 2), because, presumably, when once fruit is entrusted to its care it is independent of further manipulation. The following are the maker's notes:—

"This machine is built on the old and well-known principle of sizing fruit by the rope and roller process of gradeway, whereby the fruit is fed on to the machine at one end of a runway made up of rope on one side and revolving roller on the other, the top of the latter rolling outward. This latter side of the runway, instead of being made up of one continuous or graduated roller, is made up of a series of short rollers placed end to end, and separately and independently adjustable of each other, thus making the machine capable of the most accurate and wide range of adjustment.

"These machines are made in any and all lengths, varying from 18½ to 36 ft., standard sizes, however, being 18½ and 32 ft., and making ten sizes each. In setting up the machine it is preferable that the bins be built first that it may be set on top of them, though it can be

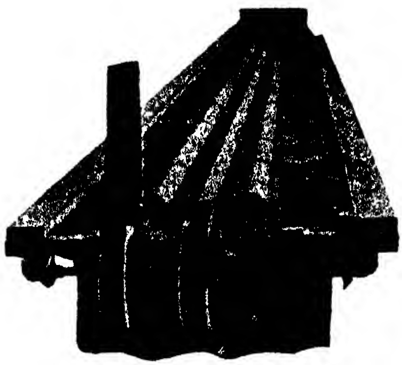


Fig. 2. Independent Roller Sizer.

set up and the bins built around it if necessary. They are delivered, knocked down, and erected in the packing-house, usually after the bins have been completed, as in most cases they can only be placed on the bins after they have been built. The price of the machine delivered and set up anywhere in Southern California is: 18½ ft., 150.00 dollars; and 32 ft., 185.00 dollars."

It will be seen that the sizer is placed over the bins to which the fruit is carried after sizing by an endless revolving canvas band. The bins are lined so that the fruit cannot get bruised, and in no case is it possible for it to drop more than a few inches. The whole of the machinery connected with the elevating, dumping, sorting, sizing, and delivery to the bins is driven by a 2-horse-power gas engine.

Delivered in the bins, the fruit is wrapped and packed by girls and women, who are able by persistent work to make from £40 to £50 in the season. Each packer wears gloves to prevent injury to the fruit.

The boxes used are similar to the standard size adopted in South Africa, but measure 26 × 12 × 12, instead of 26 × 12½ × 12½ outside. The same "packs" are in use, that is, 96, 112, 126, 150, 176, 200,

216, 250, 324, 360, but of these neither the very large nor very small fruit are favoured commercially, the sizes best liked being those from 126 to 200. It may be mentioned that machines are occasionally used which label individual fruit with a small round tab on which the packer's brand is placed, and that wrapping machines are also in use. The mechanism of these machines is somewhat intricate, and requires skilled labour to attend to them. After packing is completed, the box is placed on a roller carrier and taken to the "press". Perfection in presses has been attained by Mr. Covey, of Riverside, in his last effort. This machine has also a set of rollers on which to place the full boxes of oranges. They are packed as full as is customary in South Africa, and when nailed down have that bulge in the centre which denotes a full box well packed. Boxes are not stencilled as to the ends further than number and variety, but it is invariably the custom for each packing-house to adopt different brands, which they illustrate artistically on one end of the box in a bright picture which is marked with the "brand" of the fruit. One packing-house may have several "brands", according to the different qualities and varieties of fruit handled. Wooden cleats are used at each end when the top is placed on, and over the whole a thin iron strap is bound.

A special warehouse truck made to carry five boxes of oranges is used to take the fruit from the packing-house to the car in which it is to make its eastward journey. By its use one man can get through an enormous amount of work in a day.

All packing houses are built so that the fruit may be loaded from a platform running the length of the house directly into the cars. By this means labour is reduced to a minimum. The cars are ventilator refrigerators. Formerly two distinct types of car were used, one was ventilated and not insulated; the other was insulated and fitted for use as a refrigerator only. The car used at present can be run either as ventilator or refrigerator as may be required. It is fitted with facilities either for icing or ventilation. Interior arrangements of the simplest kind admit of the boxes of fruit being loaded and packed in such a way that they remain in one position without shaking and falling about from the packing-house siding to their destination.

Precooling.—It has been demonstrated in California in the transportation of citrus fruits to distant markets that the losses due to development of blue mould en route occurred in the earlier stages of the journey when the temperature in the cars was still moderately high. The system of precooling the cars before the journey commenced was the outcome of long and persistent experiment, and it is undoubtedly of very great assistance to the fruit shippers. It is of benefit to the citrus industry in as much as by its use the wastage of fruit en route to the markets is considerably reduced; it also helps deciduous fruit shippers in that it admits of soft fruits, such as peaches and plums, being allowed to attain a far greater degree of ripeness before being packed, thus when they arrive in the eastern States the flavour is far better than was formerly the case when fruit was picked "coloured but not ripe". There are two of these "precoolers" in southern California. The one visited at San Bernardino is the property of the Santa Fe Railroad Company, and is worth describing.

A solid brick building contains machinery for producing ice *ad lib.* A stock of 30,000 tons is kept on hand to supply the needs

of the precooler and for icing the cars. Attached to this building is a long shed with a high platform running its entire length in the centre. On either side of the platform is a railway track capable of accommodating fifteen car-loads of fruit. Along the top and in the centre of the platform, and attached to the ice-room in the main building, is a tube some 20 inches in diameter, and from this main are smaller, flexible tubes at intervals leading to the cars of fruit. These are attached to the cars and a blast of ice-cold air is forced from the ice-room by huge sirocco fans. It passes through the cars at some 6000 cubic feet per minute with the result that a temperature of possibly 70° to 80° is reduced in a short time to 45°. Afterwards the usual icing takes place, and there is a slightly less consumption of this than under the old system of icing prior to precooling days.

Marketing.—This most important function is, to the extent of 62 per cent. of the entire citrus crop, in the hands of the California Fruit Growers' Exchange, "a co-operative organization which has marketed for the citrus growers of California oranges and lemons amounting to $132,785,500, or £26,500,000 gross, but has never declared a dividend or accumulated one penny in dividends to its stockholders". So runs the descriptive title of a booklet issued by the Exchange, from which the following extracts are taken:—

Shipments of Citrus Fruits from Southern California.

Season.	Total Cars Oranges.	Total Cars Lemons.	Exchange Percentage.
1895-96	7,575	—	32 (O. & L.)
1896-97	7,350	—	23 (O. & L.)
1897-98	13,987	1,166	25
1898-99	9,448	903	28
1899-00	16,362	1,447	33
1900-01	21,173	2,924	45
1901-02	17,571	2,816	37
1902-03	19,776	2,649	45
1903-04	25,117	2,782	44
1904-05	25,608	4,274	46
1905-06	22,175	3,789	48
1906-07	23,986	3,507	55
1907-08	24,538	4,959	56
1908-09	31,895	6.196	59
1909-10	25,331	4,782	59

The growers have attained the best results in the years when the Exchange has had the greatest percentage of the fruit to sell.

The production per acre varies enormously all the way from next to nothing to 600 boxes. The average production for the season 1908-09 for the total number of acres in bearing in California, according to above acreage, is about 120 boxes per acre. The yearly cash returns per acre vary similarly to the yield and the variety of fruit grown, from next to nothing to from $1000 to $1100 per acre (the latter returns having been realized in some extreme cases account heavy yield and high prices prevailing for some particular variety sold at the top price in some particular season).

Orchardists employ 150,000 Labourers.

There are probably from ten to twelve thousand orchardists engaged in the industry, and it supports, all told, including labourers and their families, about 150,000 people.

The principal producing counties are Riverside, Los Angeles, San Bernardino, Tulare, Orange, Ventura, and Santa Barbara.

The principal distributors are the California Fruit Growers' Exchange, the Redlands Mutual Orange Distributors, the California Citrus Union, the National Orange Company, Randolph Fruit Company, and the Redlands associations, and probably the most noted single growers are C. C. Chapman, of Fullerton, E. A. Chase, of the National Orange Company, and Mr. Nathan W. Blanchard, of Santa Paula.

The approximate amount received by the citrus growers in California from the time of the first shipment east is probably something over $250,000,000. There is no doubt that the opening of the Panama Canal will be of very material benefit to the citrus grower, enabling him to put his fruit in all eastern markets at a much lower price and in better condition, which means a largely increased consumption per capita, and will open to a great extent certain foreign markets for our best fruit.

Growers Benefit by Forming of Exchange.

The first car-load of oranges was shipped from California in 1877 from what is known as the "Wolfskill Orchard" in Los Angeles, which were all seedlings. Most of the plantings had been for domestic needs only, but with the completion of the Southern Pacific Railway the growing of oranges received a great impetus which was accelerated by the high prices received after the advent of Washington Navels on the market and the completion of the Santa Fe Railway. For the first few years prices were very satisfactory, although very uneven, some growers receiving from 100 per cent. to 200 per cent. more than other growers for the same variety of fruit.

In 1885 the shipments amounted to about 1000 car-loads, and the marketing conditions were all but unbearable. At a meeting of the growers throughout southern California, held in Los Angeles, 24th October, 1885, the delegates by a formal resolution recognized the fact that unless some united action was taken for improved methods in the sale of their fruit, they would soon lose their home. They held sessions forenoons, afternoons, and nights for several days, which resulted in the organization of the "Orange Growers' Protective Union". The results for the first year were very advantageous, but after an existence of several years the Union was finally hammered to pieces by commission men and buyers who were able to make larger profits by forcing the growers to sell their fruit singly. From the time the Union dissolved to 1893 the growers were practically proportioned out among the different private shipping firms, none of whom would invade the other's territory. The writer sold his seedlings in 1892 for 10 cents per box of 70 lb. on the trees, and the fruit cost not less than 50 cents per box to raise. At this time, and for one or more years previous, certain sections or districts had formed associations in a small way, and were marketing their fruit through the officers of the associations. As a rule they received much better

results than the individual shipper, which led them to believe that their beginning, although small and weak, was along the right line. This step marks the commencement of co-operative marketing of citrus fruits in California.

T. H. B. Chamberlain, known as Exchange "Father".

Through the work and agitation of T. H. B. Chamberlain, who is known as the "Father of the Exchange", the various sections and shippers began to believe that a combination of their interests along co-operative lines would result in better methods of handling and selling their fruit, and enable them to get better results. A mass meeting of the growers was held at Los Angeles in the Chamber of Commerce on 29th August, 1893, the expressed purpose of the meeting being "To provide for the marketing of all the citrus fruits at the lowest possible cost under uniform methods and in a manner to secure to each grower a certain marketing of his fruit and the full average price to be obtained in the market for the entire season".

Following this, local associations were formed throughout the principal fruit districts on the basis that the packing of the fruit would be done at cost, and the marketing done through an executive committee composed of one member from each district. This arrangement continued through the seasons of 1894 and 1895, and, while not entirely satisfactory, gave such evidence to the growers as to convince them they were marketing their fruit along the right lines. On 24th October, 1895, the Southern California Fruit Exchange was organized on a purely co-operative basis, with Mr. A. H. Naftzger as president.

The growers organized first under the head of associations and all the associations of the locality formed a sub-exchange, which had its president, secretary, and book-keepers. Its board of directors was chosen from the representatives of its associations. The representatives of the sub-exchange, now numbering fourteen, form the directors of the California Fruit Growers' Exchange.

The associations take the greatest possible care in the picking and the handling of the fruit that it shall not suffer any mechanical injury (*as upon this will depend the percentage of decay en route*), to grade it to accurate sizes and to sort it as to quality with the greatest care, and finally to pack it as tastefully and as solidly as they may without injury to the fruit, shipping it to such points as the sub-exchange directs, and here the association's responsibility ends, though they may take part in deciding if they so desire, not only as to the market it shall be sent to, but have the final say as to the sale of it.

During the period of seventeen months, viz., from 1st April, 1903, to 31st August, 1904, the Southern California Fruit Exchange combined its interest in the sale of their fruit with the principal non-exchange shipping interests under the name of the "California Fruit Agency". The net results obtained were not satisfactory to the growers, and on 1st September, 1904, the Exchange resumed the sale of the fruit it controlled. On 27th March, 1905, the California Fruit Growers' Exchange was incorporated, and on 1st September following succeeded to the business of the Southern California Fruit Exchange.

The California Fruit Growers' Exchange directory meets weekly, and its sessions are very strenuous, every member giving his best thought and effort to the upbuilding of the Exchange. The sub-exchanges meet monthly or semi-monthly. The associations usually

meet less frequently. A copy of the minutes of the meetings of the Exchange directorate is sent the same day to each one of its sub-exchanges, and is read to the directory of the sub-exchanges at their first meetings thereafter. A copy of the minutes of each sub-exchange's meeting is sent to each of its affiliating associations, thus keeping every branch of the business in touch with each other. The head exchange has inspectors at all the principal diversion points along the main arteries of traffic this side of the Missouri River, who make detailed daily reports showing the percentage of decay and general condition of each car, and the hour of leaving, and any information of value in regard to the shipment.

Use own Cipher in Handling Business.

The Exchange has its own cipher code, which is carefully revised every year or two along lines of its own special business. Every district manager daily telegraphs either directly to the Los Angeles headquarters or to the general eastern agency at Chicago their sales or offers on fruit and any other information of interest to the Los Angeles sales managers or growers. These telegrams begin coming in in cipher about 8 a.m. Those coming in early in the day are translated and telephoned to the various sub-exchanges interested, and in some cases to the associations. Two or three additional clerks begin work at 1 o'clock p.m. in deciphering these telegrams, and it is their duty to remain as late as 12 o'clock at midnight, if necessary, in order to get all of the reports and telegrams translated and mimeographed in the morning bulletin, which goes out to the exchanges on the 3 a.m. paper trains, so that on the following morning every sub-exchange and association may know what was done on the previous day, and virtually know the condition and the whereabouts of each and every car they are interested in.

During the busy season the Exchange has from 1200 to 1500 cars each day, either on switch or rolling, so that it is easy to realize that the expense in keeping such close tab is very great, amounting in telegrams alone to from 5000 dollars to 7000 dollars per month during much of the season. The Exchange has a separate pigeon-hole to receive history cards of each brand or quality of fruit shipped by its affiliating associations.

Each car shipped has its own history-card, upon which is entered every particular of interest appertaining to that car, the date of shipment, the car number, the exchange and association numbers, whether under ice or not, by what line routed, the variety of fruit, and the number of boxes and the size in each, and all other matters of special interest at date of shipment, and each morning as the bulletins referred to above are received the additional information therein contained is transferred to that car's special card, so that in a moment's time the manager of the Exchange or sub-exchanges can refer to any particular car, tell very closely where it is at that moment, and its full history as to sale, diversions, and to condition, appearance, decay, etc.

This is a matter of incalculable benefit in handling the cars to the best advantage, and enabling the Exchange, by their right of diversion, to keep every market in the country evenly supplied. Notwithstanding all this minute care and expense, the business is so large that the average expense of selling each box is less than 7 cents.

All citrus growers in California have been largely benefited by the successful operation of the Exchange. The commission men, the independent buyers and speculators can no longer make a football of the non-members of the Exchange, as he is able to form a very close guess as to the returns on the various kinds of fruit which will probably be made to the members of the Exchange, and unless he can receive a price approximately near this amount he is likely to become a member of the Exchange the following year.

Buys all Growers' Packing Material.

The Fruit Growers' Supply Company was organized in 1907 for the purpose of purchasing all packing material used by the Exchange growers. Through it favourable long contracts have been made at fair prices, so that the charging of exorbitant prices by the manufacturer and seller has been made very difficult, if not impossible, and great savings effected in the aggregate, not only to all Exchange members, but to all other citrus fruit growers, as the manufacturers realize that unless they sell to the latter at about the same price the Exchange members buy, the non-members would join the Exchange.

In addition to the Fruit Exchange, the orchardists have combined and formed a Citrus Protective League which has for its object the furthering of the citrus interests in California in every possible way. Their secretary and manager is Mr. Harold Powell, late of the United States Department of Agriculture, which Department still retains Mr. Powell on its staff at a salary of one dollar per annum. This gentleman afforded the writer every possible opportunity of meeting the officers both of the League and Exchange, and was most kind in every way. Discussing the probability of the orange interests of South Africa clashing with those of California, it was recognized that the only possibility of such an occurrence would be when the Valencia Lates of California were exported to Europe when they would come into competition with our Washington Navels there. It is not likely that this will take place for some years yet on account of the demand for the late oranges which exists in America. There should, however, be a possibility, if the citrus industry in South Africa is developed properly, of our Washington Navels competing in America with the California Valencia Lates. It will be a matter of transportation only.

Horse-Breeding in South Africa.

A VOICE FROM THE PAST.

[Mr. W. Grey Rattray, now of Craighall, near Johannesburg, and formerly editor of the *Racing Calendar*, a recognized authority on all matters pertaining to horses and horse-racing, noting the attention now paid to the question of horse-breeding, forwarded a copy of the following essay written by himself and published in connection with the Port Elizabeth Exhibition of 1885. It is of great interest to-day, and if read carefully and compared with existing conditions should prove of value to our horse-breeders.]

THE original horse of South Africa would appear to have been a hardy, undersized, strong animal, presenting few qualities beyond endurance and strength.

Montgomery Martin, in that part of his history of the British Colonies which treats of the Cape of Good Hope, has the following observation respecting its horses:—"The horse is not generally large but it is extremely hardy. I have ridden one upwards of twenty miles without ever going out of a canter—the usual pace of the animal." A much fuller account of the Cape horse might have been given than this, and certainly something far more interesting.

Mr. Surtees, a good authority, tells us that at the time of the English occupation of the Cape in 1806, the breed of horses here was probably a cross between the Barb of Northern Africa and the Persian or Arab; the latter must have been introduced by the Dutch East India Company, but as to the time of the introduction of the former there is nowhere any record; still there can be no doubt that the Cape horse was in many respects Barb bred. In many points he yet resembles the horse of Spain, which partakes of an African origin and in no respect does he more approximate him than in his paces—the amble and the easy canter are both alike.

Shortly after the English occupation of the Colony, the area of which at that period was circumscribed, the populated part being confined to the portion now known as the Cape Peninsula, the attention of the colonists was directed towards the improvement of the breed of horses, and it was during the administration of Lord Charles Somerset as Governor that the English thoroughbred horse was first imported. Lord Charles, like nearly every member of the great family from whence he sprang, was at heart a sportsman and passionately fond of the equine race. Sportsmanlike, he was a genuine believer in the thoroughbred as the most useful horse for all purposes, and considered that he would be especially suitable for begetting roadsters capable of accomplishing long journeys over the primitive roads then in use throughout the Colony. Having set his mind upon the improvement of the Cape horse by means of the thoroughbred, he was not long in putting his theory into practice, and an order for several sires of the best blood in England was at once dispatched. I cannot definitely ascertain which was the first

thoroughbred imported, and a perusal of the English Stud Book does not in any way assist me, although there I find that, between the years 1811 and 1820, twenty horses and two mares left England en route for the Cape, six of the former of which died on the passage. Amongst the best known of the male gender, I may mention Claudio by Gohanna out of Belissa by Phenomenon, Cottager by Hambletonian (dam by Dragon), Bang Up (afterwards Shenley) by Young Sir Peter (dam by Tantrum), Merry Andrew by Dick Andrews out of Sister to Bangtail, Diabolus by Williamson's Ditto out of Magnolia the Younger, Kutusoff by Waxy out of Rival by Sir Peter, Cricketer by Sir George (dam by Ruler), David by Sir David (dam by Stamford), Yaffil by Popinjay (dam by Woodpecker), Pompey by Windle out of Anna Bella by Shuttle, Fascinator by Sorcerer out of Hannah by Gohanna, and Vanguard by Haphazard out of Vestal by Walton. The mares, of which I believe many descendants are still to be found scattered over South Africa, at the time of importation were unnamed, being "Mare foaled 1801; got by Driver out of the Herod mare, dam of the celebrated racers and illustrious sires, Pricipitate and Gohanna", and "Mare by Haphazard, dam by Tantrum". Much good resulted from these importations not only in the immediate improvement of blood, but also in the general interest on the subject which was created. So satisfied were the colonists with the wisdom of Lord C. Somerset's idea of the thoroughbred as a sire, that the importation of these animals continued, and during the decade 1820-30 such notables as Skipper by Scud, Scipio by Filho da Puta, and Battledore by Sir Oliver, reached us. During 1830-40 these were followed by Protector by Defence, O'Connel by Young Emilius, Rococo by Cetus, Lindley (afterwards Discount) by Banker, Humphrey by Filho da Puta, Squirrel by Cain, etc. Most of these horses were purchased at prices then considered exceptionally high and now seldom heard of in connection with the purchase of horses for exportation here. Mainly owing to the enterprise exhibited by Mr. T. B. Bayley, an eminent colonist, whose loss we have great reason to deplore, the import trade improved both in numbers and class during the succeeding ten years, 1840-50, the roll for which may be set down as the best of all time. It included a large number of stallions who for years had been standing at the public service in England. Many of this number, besides possessing undoubted merit as racehorses, had in England sired horses that subsequently became famous, and the pedigrees of some of these sires crop up in the genealogy of many well-known English racehorses of the present day. The selected of the sires imported during this period may be set down as Tally Ho by Emilius out of Misrule by Merlin, Gorhambury by Buzzard out of Brocard by Whalebone, Orion by Bay Middleton out of Silvertail by Gohanna, Ruff by Jerry, Flytrap by Bay Middleton, Moscow and Middleham by Muley Moloch, Peter the Hermit by Gladiator, and Evenus by Alpheus. Prior to his purchase for exportation, the last-named horse was the property of the then Earl of Stradbroke, and had carried his Lordship's colours to victory in such eminent contests as the Royal Hunt Cup and the Cambridgeshire. Middleham won the Liverpool St. Leger, and all of the other horses mentioned were winners of note. Prominently amongst the younger horses imported in this famous decade shine out such worthies as Sponge (sire of Express), Winchelsea, Fancy Boy, Seth, Eleusis,

Bramble, and Sir Launcelot. The notables amongst the mares included Astra by Astrachan, mare by Almack (subsequently named Camelina and dam of Express), Post Haste by The Colonel (covered by Jereed), Georgian by Buzzard out of Variety by Selim, and Taffrail by Sheet Anchor (dam by Whisker). The two mares last mentioned were covered in England by Sir Hercules, the sire of Birdcatcher, and to him Georgian dropped a colt foal which was subsequently named Sir Hercules. This colt afterwards became famous as a sire, his name frequently occurring in the pedigree of horses bred in the Hantam.

Business did not slacken during 1850-60, and the quality, although not quite up to that imported in the preceding decade, was still commendable. The importations included Pantomime by Pantaloon, Lammermoor, Cockermouth, and Mr. Martin by Lanercost—the last named described in the *Sporting Magazine*, the recognized authority of the day, as one of the handsomest horses England ever produced—Cornboro by Flatcatcher, Mayor of Hull by Shawn Buidhe, Wrestler by Orlando, Berkeley by Teddington, Sylvan by The Saddler, Early Morn by Chanticleer, Saraband by Cotherstone, Wentworth by Bay Middleton, and Mortimer by Fitz Allen. The last-named horse was the first thoroughbred imported into Natal. The best known of the matrons were Meliora by Melbourne, Georgie by Orlando, Idolette by Storm, and Hebe by Herbalist.

1860-70 brought a large number of horses to our shores, the most prominent being Bonnie Morn by Chanticleer, Nothing More by Hospodar, Commissioner by Orest, King William by Poynton, Naughty Boy by Idle Boy, Newsmonger by Newminster, Nugget by West Australian, and Tormentor by Wild Dayrell. Tormentor was exported from England to Mauritius, and afterwards exported from that island to the Cape.

About the year 1870 the attention of certain unscrupulous speculators was directed to the desire on the part of our Dutch farmers to possess imported stallions, and in consequence numbers of the sorriest rips that ever escaped the knacker were imported. These horses were selected by the speculators to gratify their customers' predilection for animals endowed with small heads, pointed ears, and peacocky carriages, with an utter disregard of bone or general conformation. During the sixteen years from 1870 till the present time several hundred animals of this class have been imported, most of which were purchased at Tattersall's for a few guineas, brought out here and sold for half as many hundreds. An instance is on record of a horse purchased at public auction in England for five guineas being sold here for £500. I do not think I am wide of the mark when, leaving out the best known and valuable stallions imported privately, I assess the average price paid for the remainder as fifty guineas. A perusal of the English blood stock sale returns shows that the majority of those imported which were sold publicly did not realize anything like this sum, the range, as a rule, being from three to twenty-five guineas. Independent of the speculator brand of thoroughbred, there were many good horses imported during the period named, and I select from the list a few deserving of special mention, viz.:—Belladrum, Champagne Charlie, Buxton, Erl Koenig, Moorfoot, Elf King, Sir Marmaduke, Plunger, Student, Catalpa, Monk, St. Augustine, Sportsman, Fire King, and Whackum.

Having now traced the history of the South African horse from the earliest period, I must hark back and discuss his merits after the

introduction of the thoroughbred. Prior to the English occupation but little is known of the horse further than what is stated in the opening paragraph of this paper. It may interest colonists to learn that the first horses imported into Australia were from the Cape, produced by the thoroughbred stock imported here about 1810 from the common mares of the country. These animals appear to have been got without selection, and to have been but sorry brutes. Atkinson, writing in 1824, says of them: "They are but nags in size and bred without much care; by no means sightly in appearance, being narrow-chested and sharp-backed, as well as deficient in the quarters. They have an incurable habit of shying, and are by no means sure-footed." This description would doubtless equally apply to the Cape horse of the year 1815 or thereabout. Ten years later, however, a vast improvement had been effected in the general quality, and about the year 1825 the Cape horse was sufficiently attractive to provoke the admiration of the lordly but debilitated Indian Nabobs, who at this period flocked in large numbers to the Cape, then highly esteemed as a health resort, and many horses were taken to India as hacks and chargers by the recruited health-seekers. For these the Nabobs, who were always lavish in dispensing the golden mohurs, paid very high prices, and they being the best of their class, and able to stand the trying Indian climate much better than the English-bred horse, soon attracted the attention of the Indian Government authorities to the advantages of the Cape as a field for procuring remounts from, and in 1835 a small trade was opened up which bade fair promise of yearly increasing in magnitude. An eminent veterinary authority, in writing of the Cape horse of the period 1850-1860, says:—"In its breed, in its shape, in its colour, and in its temper, the horse of the Cape is very different from the English horse of any kind. A century ago possibly the difference was greater even than it now is; but since the time when Lord Charles Somerset was Governor of the Colony, the old Arab blood has been more mixed with English blood than it was previously and now that the best of English blood is being yearly imported there, it may be expected that in time the peculiarities of the Cape horse will disappear, and, as has been the case with English horses, from an admixture of blood, something excellent in its kind will be at length obtained. It is in shape and make, or what are termed the good points of a horse, that the Cape horse is so far inferior to the English. Such a thing as good forelegs are very rarely seen in the Colony, yet this might easily be amended were more care taken of the horse when young. A most detestable practice, termed knee-haltering, is in vogue, which cannot be too strongly condemned, as it decidedly cripples a horse in his forelegs. A horse subjected to this practice for a few months will be a stumbler to the end of his days. To add to this defect, the probability is he has a heavy straight shoulder—nothing is more common amongst all, even the best, Cape horses. The principal imperfection of these animals is without doubt their forelegs; a good thighed horse may often be met with, but a long arm, with a short, good leg, rarely."

About 1840 the South African Turf Club was founded, and I was recently favoured with a copy of the programme of its autumn meeting, held on the Green Point course in April, 1845. In the list of stewards I was pleased to observe the name of the present genial Usher of the Black Rod, Mr. M. Blake, who, I think, is the only living representative of the early Cape school of sportsmen. The programme

in question compares favourably with the latter day programmes of this same club, being almost as valuable. In 1845 the principal race was the Produce Stakes for three-year-olds, and its value was £360. It was the introduction of this race which held the same reputation in Capetown that the Epsom Derby did in England, that gave the extraordinary fillip to the importation of sires of exceptional merit. No matter how much racing is decried by that class designated the respectable, and how much it is alloyed with numberless objectionable concomitants, it must be tolerated and nourished as a means to an end, viz., the improvement of the breed of horses. Shape and pedigree can be judged by observation and research, but competition is the true and only test of speed and stoutness, and it is by that means alone that the breeder can determine whether or not the young colt is possessed of sufficient merit to be in after years advanced into the position of a lord of the hara. Again, racing is the only true test of individual sire's produce, and is a certain guarantee of the maintenance of a high standard of excellence in our horses. Stonehenge, one of the greatest living authorities on the horse, says: "If racing was not encouraged we would soon find the thoroughbred disappearing altogether." The formation of the South African Turf Club, with its biennial gatherings soon demonstrated to the Cape breeders the value or worthlessness of the stock they were breeding from, and from the year 1840 to 1860 a considerable improvement was effected in the general stock of the Colony.

It may be said that the Cape horse, taken generally, reached the highest state of perfection it has yet attained during the decade 1850-60, and it was during this period the Indian authorities appointed a resident commissioner at the Cape for the purchase of horses suitable for remounts. This office was filled by Lieutenant-Colonel Apperly, and this able officer and most efficient judge was thoroughly satisfied with his purchases and was much impressed with the value of the Cape Colony as a horse-breeding country. In an address delivered at Capetown on the subject of horse-breeding, this gallant officer, after pointing out the great capabilities of the Cape as a horse-breeding country, went on to say: "Every shoulder should be put to the wheel to improve such a wonderful and only half-developed country. Horse-sickness can be avoided by erecting proper sheds for the mares and foals, and growing fodder of some sort, roots or cereals, to feed them on during the prevalence of the disease. If the farmers do not think their horse stock worth this little expense and trouble, they deserve to suffer, and the Australians will ultimately deprive them of the Indian market." Some idea of the value of the export horse trade carried on during this period may be gathered from the following statistics given by Colonel Apperly prior to his departure to the East: "Since the outbreak in India became known, 5482 horses and 108 mules have been shipped to Calcutta and Bombay, and the following large sums of money have been disbursed amongst the farmers of the country and speculators, who are all more or less cultivators of the soil—paid for horses, £156,853; for mules, £2445; for forage, £47,265; for keep of horses on farms, £9082; in all, £215,645. This large sum is exclusive of shipping charges, servants' wages, and horse gear of different sorts." The only complaint Colonel Apperly had against the Cape horse was want of size, consequent on the mares and foals being starved during droughts and having no protection from the cold experienced during

the winter seasons. During all his peregrinations he never saw a spavined horse, but curbs often; and yet—will it be believed—the removal of such things by the iron is still unknown, and as to firing, if it has been ever heard of by the farmer it has assuredly never been attempted.

The departure of Colonel Apperly practically extinguished the Indian trade as the breeders were not sufficiently enterprising to follow it up by exporting private batches, and a large annual revenue was thus lost to the Colony. This is the more to be regretted when it is considered that the Cape horse was eminently suitable for the required purpose in every point except size, and this could easily have been remedied by a little attention. A proof of the excellency of the Cape horse for military purposes was afforded when the Crimean War broke out. Several of the Cape-horsed cavalry regiments then located in India were ordered to Russia, and the hardy Cape horses acquitted themselves admirably in that most trying campaign. A very high tribute to the Cape horse of this period was recently paid by an old Indian officer in writing to the *County Gentleman* on the much-discussed subject of the superiority of the Australian over the English-bred horse. He says: "I still adhere to my previously expressed opinion that whether as a racer, hunter, charger, or draught horse, the English-bred animal is superior to his Australian contemporary, although I will not deny that the latter may stand the Indian heat better. For a good all-round horse, capable of standing hot and cold weather in the open and keeping his condition through it, recommend me to the stamp of horse that was imported from the Cape during the Mutiny. With a favourite charger who came from that part of the world, where he had been purchased in the ordinary way as a trooper, I rode 120 miles inside fourteen hours, and I am perfectly satisfied that my gallant steed could have gone on for three or four hours more without knocking up. As an all-round horse he was a marvel, being an irreproachable charger and perfect in harness. During an up-country residence I put him in training for a garrison race meeting, and he won everything he started for both on the flat and over timber. He repeated this performance about a year afterwards in Ceylon, where, during my residence, he was absolute cock of the walk."

Since Colonel Apperly's departure little has been done by our breeders to re-establish the Indian trade and still less to remedy the want of size complained of by that officer. In all the Colonial wars this has also been a complaint regarding the Cape horse. His capability in point of endurance, and all other points except size, has been such as to call forth the highest encomiums from many leading English cavalry officers. In the Zulu war thousands of South African-bred horses would have been used had they been of sufficient size. In the Basuto war nothing else but home-bred horses were used, and they proved admirably suited for the purpose, failing only from want of size where they had to carry extra heavy burdens. During the recent Bechuanaland campaign a large number of home-bred horses was purchased on account of the Imperial troops. The purchase of these animals was entrusted to a speculator, who in turn sub-let small contracts to individuals in the different districts. The last named were set a limit as to price, about half the sum the chief contractor was receiving from the Imperial authorities, and in

consequence they were unable to procure the best animals. I do not hesitate to assert that had trustworthy agents been dispatched amongst the horse-breeding farmers to purchase troopers at the price the Imperial Government paid the speculator, a sufficient number of animals equal to the work required from heavy dragoon troopers could easily have been procured. As it was the horses purchased were anything but creditable to South Africa as a horse-breeding country, and militated seriously against its capabilities in that respect in the opinions given by the officers engaged in the campaign in answer to the circular addressed them by His Excellency Sir Hercules Robinson requesting information as to the suitability of the South African-bred horse for cavalry and artillery purposes in India. The circular was sent out by His Excellency at the request of the Port Elizabeth Agricultural Society, which was desirous of seeing the patronage of the Indian authorities extended to South Africa for a portion of their remount requirements for cavalry and artillery purposes. It was mainly owing to the adverse opinions received from the officers as to the size of the South African horse that the matter was not prosecuted further, and the want of size in the horses purchased for the Bechuanaland expedition is solely attributable to the greed of the Government contractor and his satellites. In the opinions received, Colonel Curtis, commanding 6th (Inniskilling) Dragoons, says: "I am unable to speak favourably of the class of horse to be found in the Cape Colony. I have purchased about seventy remounts for the regiment under my command, and am of opinion that they are light, undersized, and not up to the weight they have to carry. Of those chosen and bought, only seven (the best) were taken, and even these were of an inferior class for cavalry service. The horses purchased by the Remount Committee for the Bechuanaland Field Force (mounted infantry and mounted rifles) averaged 14 hands 2 inches in height, and were, as a rule, lightly built. In my opinion the deterioration in quality and size of the Cape Colony saddle horse during the last fifteen years is owing to indiscriminate breeding, a want of care in the selection of suitable sires and dams, careless rearing, and want of protection of the young during the inclement season. Breeding indiscriminately through some thoroughbred stock produces the many weedy horses to be seen."

The Honourable Paul Methuen, Colonel 1st Mounted Rifles, says: "So far as I can judge I entirely agree with Colonel Curtis and do not believe the Cape horse equal to the weight of a cavalry soldier and kit. Not overweighted and not overpaced, it is a marvel to me what work these horses can do, animals with scarcely a good point to recommend them."

Colonel Carrington, 2nd Mounted Rifles: "I consider it very doubtful whether any number of horses could be obtained in the Cape Colony suitable for English cavalry in India. As a rule, the horses in South Africa are too light and undersized for cavalry purposes, and when sufficiently strong to carry the weight are too often coarse and underbred. The Cape horses are without doubt hardy and tough and of great endurance, and being very tractable are, I consider, well adapted for mounted infantry or mounted riflemen."

Major R. H. Martin, commanding 3rd Mounted Rifles, says:—"The horses received from the remount depot for this regiment are not up to the weight of the cavalry soldier in marching order (over

18 stone even in light cavalry). The Indian climate, I think, would suit them, and, if a very judicious selection were made, they would be suitable for mounted infantry in that country, and would be especially suitable for native cavalry, who generally are lighter men and carry lighter equipment. The rank and file of native cavalry used to supply their own horses. I do not know if this is still the case, but if horses are now supplied by Government I should think these horses would be most suitable. Horses such as a few of the very best of those we have might possibly carry the cavalry soldier of the line, but taking them as a whole, I could not recommend them for that purpose."

It seems, therefore, that the South African horse of the present day in a general sense is inferior to that of a quarter of a century ago. For the reasons annexed to this we have not to go far to seek, they being all attributable to the introduction of the speculator brand of thoroughbred and indiscriminate breeding.

Few parts of the world are so well adapted by nature for the breeding of horses as the Cape Colony and the conterminous independency, the Orange Free State; and it is surprising that this industry, the most fascinating and profitable branch of pastoral farming, is not pursued on more defined lines by our landowners. The unsophisticated Boer will tell you that horse-breeding does not pay. nor will it ever while it is pursued in the listless, haphazard fashion it is now. To make it pay and pay well it must be conducted on sound principles. No matter for what purpose the breeder is breeding, be it for racing, saddle, draught, remount or artillery, a certain amount of care and attention is necessary, especially in the selection and mating of the sires and dams. With this given, and average seasons favouring the breeder, horse-breeding will pay better than either sheep, goat, or ostrich farming, as the markets of the world are open to the Colony, and there is an unlimited demand for horses at remunerative prices in Europe and India, which at any time is likely to be increased in an alarming degree in the event of a European war breaking out. At the present time the country is fairly overrun with horses for which no market can be found, principally owing to the inferior character of the article. That this is so is evidenced by the fact that any decent-looking horse of any size, broken or unbroken, offered at an auction market still commands a good price, and bad as the times are it is extremely difficult to pick up a moderate horse for anything under £20. That good, serviceable animals, eminently suited for cavalry remounts, can be obtained in the Cape Colony was proved to the writer on the occasion of a recent visit to several of the large breeding establishments, but unfortunately their individual owners are not possessed of them in sufficient numbers to warrant their exporting, nor do they care to part with them at the unreasonable figure offered by the speculator. What is required in the first instance is a breeders' society, which, besides looking after the general welfare of horse-breeding, would undertake the exportation of suitable animals. A lengthened correspondence on the subject of the exportation of horses has for some time back been carried on in the columns of the *Racing Calendar*, a paper which from its foundation has strongly advocated the resuscitation of the Indian trade, and recently a writer in that journal suggested that in order to thoroughly test the matter, a small limited company with a capital of £2000 should be formed. The suggestion is a thoroughly good one, and highly worthy of being

adopted. Surely we can find a couple of hundred men interested in the breeding of horses possessed of sufficient public spirit to lay out £10 each for the purpose of practically testing what may, and very likely will, ultimately prove an annual mine of wealth to the Colony? We see from Colonel Apperley's statistics what we have lost. At the present day the Indian demand is greater than ever, and £1,250,000 may be set down as a fair computation of the amount annually expended by the Indian authorities in the purchase of imported horses, and a considerable portion of this sum could by judicious management be diverted into the pockets of the South African breeders. Nearly all this money goes to Australia, a continent indebted to the Cape Colony for the first horses that ever trod its earth. It seems more than strange that a country so much younger than ours, and with no greater natural advantages, should cut us out of the Indian trade. In 1860 Colonel Apperly, in tendering an advice to our breeders to take care of their young stock, warned them that if they neglected this advice they deserved to suffer, and the Australians would deprive them of the Indian market. How prophetic this utterance was we have seen, as for years past not a single Cape horse has been exported to India, which, as before stated, is now almost wholly supplied from Australia, and fears are entertained at the Indian headquarters that that Colony, great although her resources are known to be, will be unable to keep up the supply if a European war breaks out. That the fears are reasonable cannot be denied, as war in Europe would drain every country of its horses, and the combatant paying the best price would have the best mounted cavalry.

Had our farmers only followed the excellent advice tendered by the last Indian resident commissioner, the Indian trade would never have left us. The Australians soon found out the class of horse wanted for the Indian market, and bred to produce him, remedying each defect discovered by every means in their power. On the other hand, our breeders pursued their avocations in a listless, haphazard fashion, and paid no attention to the oft reiterated warning that the stock they were breeding was deficient in size, and it is chiefly to the careless apathy displayed that we owe the loss of our export trade. In the course of my wanderings in South Africa I have been privileged in visiting many of the best known breeding establishments, and although in several a little system prevails, the greater number are carried on without the slightest regard to even the rudimentary principles. In many instances I have regretfully noticed the mating of fine mares admirably adapted to breed remounts from with trashy stallions of the speculator brand, whose great recommendation in the eyes of their owners was the small head, pointed ears, and arched neck.

Before entering upon the subject of breeding, it may be advisable to mention the districts of South Africa best adapted by nature for its profitable pursuit. In the west, Caledon, Swellendam, and the famous Bokke Veld, would be most suitable; and in the east, Somerset, Cradock, Tarkastad, Middelburg, Colesberg, Albert, Dordrecht, and all the country to the east; also Griqualand West and the greater portion of the Orange Free State. These districts enjoy comparative immunity from the ravages of horse disease, grass is plentiful in the spring and summer, and could by the erection of silos be conserved for use during severe droughts. It may not be out of place here to suggest that the Government should print in book form in the English and Dutch

languages and circulate amongst our farmers the admirable notes on the stock diseases of our country, and the means for their prevention, compiled by the colonial veterinary surgeon, Mr. D. Hutcheon, than whom no better authority on the subject could be found.

In the selection of a farm for horse-breeding nothing can excel a limestone formation, as the water on farms so situated, if river or spring water, contains a due proportion of the phosphates that tend to the natural development of bone. Low, marshy situations are unfavourable to the constitution of the horse, and tend to make him coarse, unwieldy, and generally unsound.

With the proper farm selected and thoroughly enclosed, for this is a *sine quâ non* in practical and successful horse-breeding, the breeder must see that proper accommodation is provided for his stallions and adequate shelter for the mares and foals during the cold winter nights. It will scarcely be credited what shelter alone during the winter nights will do for the improvement of the size of the young horse. An idea prevails that if a young horse is well fed he will withstand the most inclement cold. In a sense this is true, for he will if well fed withstand the cold, but he will never grow in it, and, as previously demonstrated, size is what we principally require. It follows that shelter for mares and foals is essential. It is surprising how well young horses will thrive on the veld in very trying winters if they are only sheltered during the nights, even if the shelter is the primitive bush hovel. In the selection of a farm the breeder should endeavour to obtain one abounding in vleis, as in summer the succulent grasses that grow in these oases could be reaped and conserved for winter use.

The best stamp of horse to start breeding is a horse suitable for the Indian trade, as troopers are equally valuable for the ordinary saddle and draught purposes of the country. I gather from the *Racing Calendar* of 22nd July that what the Indian authorities require is as follows: Height, not under 15 hands; age, from four to seven years, broken or unbroken, the latter preferred; for dragoon horses blood power and good bone are essential; for artillery, bone power and as much blood as possible; mares and geldings only taken, the latter preferred. The price for suitable animals delivered in Calcutta, Bombay, or any other Indian seaport, ranges from £50 to £60 per head, and the expense of transporting a horse thither I have ascertained to be under £9, so that £46 can be reckoned as the average price in Capetown, Port Elizabeth, East London, or Natal. From the same paper I also learn that the Indian authorities are most anxious to open up a trade with the Cape, and if one or two favourable shipments were made it is believed they would appoint a resident commissioner to take over horses in one of our seaports.

There are thousands of mares in this country specially suited for breeding remounts from, and I do not think any breeder will experience much difficulty in picking up say a hundred of them at £15 per head, and they are dirt cheap at that price, as many of the mares I have seen recently sold at or about that figure would realize it quite three times at Horncastle or any other great English fair. In selecting the mares it is essential to choose only those having not less than three direct infusions of imported thoroughbred blood in their veins. They should likewise be young, and all those who have ever been mated with a donkey should be passed over, as asinine attributes will attach to their succeeding progeny even if got by a

thoroughbred horse. In height the mares should be quite 15 hands high, with large barrel, strong back, long and broad quarters, muscular thighs, large boned hocks, well set back shoulder, strong forearms, and plenty of bone below the knee, 7½ inches girth being the minimum in the last-named respect. No mares, if suitable in other respects, should be rejected on account of possessing plain heads, although lean, blood-like heads and well-shaped necks are a recommendation. No commissioner will reject a horse on account of his head alone, and it should be remembered by all lovers of horse-flesh that, as a rule, small heads denote cunning. To breeders already possessed of mares built on smaller lines than those I have laid down, and with sufficient blood, I should advise the purchase of a Norfolk roadster to mate with them, as he would be likely to get many horses suitable for remounts, and his fillies when crossed with the thoroughbred would produce the exact article required

For sires the experience of the breeders of the world has proved that nothing beats the thoroughbred English horse, and for the purpose of getting remounts from the Colonial mares above described a thoroughbred of the stamp used in England for the begetting of hunters should be acquired, that is, a horse standing quite 16 hands high with great power and bone. He should be strong enough to carry 16 stone over any country, and his stoutness should if possible have been proved by the usual test of his having carried heavy weights to victory over a trying course. A horse of the required character could not be obtained in England for less than five hundred guineas, and at the present time we have very few stallions in South Africa at all suitable for the purpose. To select the most suitable from amongst our living sires I should choose Buxton, Elf King, Fire King, Catalpa, and Harkaway, all of which are possessed of the required substance, and the two first-named have the additional merit of their stamina having been attested in many a hard fought race. There are several other sires in the country of substance enough, but I would not recommend them on account of bad legs or some other equally fatal point. As a whole, the class of stallions in use throughout the country is a disgrace, and I should like to see nine-tenths of them handed over to the veterinary surgeon for addition to the list. It is imperative that a stallion should receive a certain amount of daily exercise, and this, I regret to say, is seldom accorded to our sires, who, as a rule, are cooped up in a box from year's end to year's end and only breathe the fresh air when brought out for covering purposes. A few months ago I saw a valuable stallion who had not been outside of his box for over eight months, and I do not think the box had been cleaned out for a like period, as the litter was over the horse's fetlocks and his feet had grown quite a foot long. The owner of this horse was rather proud of him, and in reply to my query as to why he did not look better after his comfort, said: "A stallion is all right so long as he is well fed." Never was greater mistake made. A stallion's comfort should be as thoroughly cared for as a racehorse in training. He should be properly groomed twice a day, his feet kept in perfect order, and each day should receive two or three miles of walking exercise, with a gentle canter of a mile once a week. In this country a mistaken idea exists that a stallion should always be grossly fat. Melbourne, one of the greatest thoroughbred sires of all time, when fat was

impotent, and many other similar instances are on record. All things equal, stallions accustomed to daily exercise will beget better stock than those cooped up. Experience proves that mares exposed to the vicissitudes of the weather, if put to a horse overdone with warmth and stimulating food, throw unhealthy, misshapen foals resembling neither the sire nor dam. An impression obtains in some quarters that the Arab horse is the correct thing for a South African stallion, but experience teaches us that he has been of little use as a sire for many generations, and cannot at all be compared with the English thoroughbred. Again, the size of the Arab horse, which seldom exceeds 15 hands, would militate seriously against him, as we particularly want size and cannot look to obtain it from the use of an undersized horse.

Having secured a suitable sire and a complement of the mares already described, the next thing would be for the breeder to start a stud book in which he should enter alphabetically the name of every mare he possesses, with full particulars as to where she was bred and the full extent of her pedigree that can be obtained.

When the covering season comes round, every time a mare is covered an entry of the date should be made in the stud book, as thereby the breeder would be enabled to ascertain the expected date of each foaling, and, in order to prevent accidents, could have the mare brought into the homestead during the foaling week. Immediately the foal is born an entry of the date of birth, sex, and markings of the foal should be made.

Large camps, capable of supporting twenty mares each, should be constructed, converging towards the homestead, and the hovels, which can be very cheaply constructed of wattle and daub, should be placed as near the homestead as possible. Each mare should have a separate hovel (although the full complement can be built in a row) which she will soon learn to know if she is fastened up every night for the first two or three weeks of her residence on the farm. During the summer months she can run night and day, but as the winter comes on she will surely find her way at sundown to the hovel which sheltered her in the preceding cold season, and during severe droughts she should be fed in the evening in the hovel. When the foals are weaned, the colts, unless thoroughbred and tracing back to the English Stud Book, should be castrated. The present fashion of keeping all colts with any pretensions to breeding, entire, is one that cannot be too severely condemned. Many of the undersized, weedy-looking brutes we see disgracing our country owe their existence to colts of this description being left entire and covering mares while about eighteen months old and running alongside of their dams. The thoroughbred entire colts when weaned should be allotted a separate camp in which to run in the daytime, and be stabled and fed every night, and any of them when three years old or earlier showing signs of bad legs, weak loins, or any other deformity, should be at once subjected to the knife no matter how well bred he is, for blood must always be sacrificed to shape. Horse-breeding will pay and return extraordinary interest for the money invested if pursued on the foregoing lines, even if every mare on the farm is fed nightly during droughts. Feeding sufficient can be obtained by reaping the surplus grass in bounteous seasons, and crops of roots, such as mangold wurzel, can be grown with little expense on any farm possessing a plentiful water supply.

While our breeders refuse to pay attention to their studs and mate their mares to any stallion so long as he is thoroughbred, they will find horse-breeding an unprofitable pursuit. On the other hand, those who pursue the industry on the lines laid down will soon prove by the prestige gained by their stock and the balance at their bankers, that attention is the ladder to success.

At present the majority of our horses are miserable weeds, and their successors promise to be still further useless through the indiscriminate use of miserable stallions whose only recommendation is a high sounding, flashy pedigree, with possibly the additional incentive of having won a race where the animals he encountered were, if possible, worse than himself.

In Germany the Government is proprietor of a large number of high class, specially selected stallions, picked principally for their likelihood to beget cavalry horses. These horses travel about and serve farmers' mares at the low fee of 5s. per head upon condition that the Government has the right of purchase of the produce at a fixed sum at three or four years old. If the Government of this Colony could see its way to introduce some plan of this kind, the former prestige of our horses would soon not only be restored but improved upon.

I have long been of opinion that our Government should in some central part of the Colony found a gigantic stud farm where horses, cattle, goats, sheep, and asses could be bred for sale for stud purposes. The institution of a farm of this description would prove the making of the pastoral industries as Government could place a ban upon the importation of all stock which could not pass the inspection of a competent official. Naturally, rather than incur the chance of their imported stock being condemned, our farmers would purchase their changes of blood at the Government stud farm, where the rule of the survival of the fittest in the state they were born should be rigidly carried out, the knife being ruthlessly applied to all weedy and inferior lots. At the outset a farm of this description would not prove remunerative, but even if by its institution the country lost £10,000 a year for a few years it would be money well expended. Ultimately, when its object became appreciated, it would become self-supporting.

Another method to improve the breed of horses would be the imposition of a tax on stallions, but I am afraid that any attempt in this direction would be hopeless as our farmers are too short-sighted to perceive that the tax would in time become a benefit.

The Jockey Club of South Africa, founded in 1882, is beginning to make its power felt in the land, and the many valuable stakes offered at the race meetings held under its auspices will have a wholesome effect in tending to improve the breed of horses. I notice that a Derby of the value of £400 for South African-bred three-year-olds, was run for the first time at Port Elizabeth in October last, and won by a colt whose shape will compare favourably with that of even the best horses in England. This Derby promises to become an annual institution, and its effect will be duly felt, as also will that of the other valuable races offered at the Jockey Club meeting. One of these, to be decided at Kimberley in October this year, is of the value of £750, and I am informed this is the most valuable stake ever offered in South Africa. For several years back the racing at Capetown has not been quite what it might have been, and doubtless this

has had a depressing effect upon breeders in the Western Province. However, I learn that a step in the right direction has been taken, the two clubs existing in Capetown having amalgamated, and the race meetings of the future promise to outrival any of their predecessors. Before leaving the subject I would recommend the executive of the amalgamated Capetown clubs to discountenance the continuance of pony, galloway, and other such like races on their programmes. The Government might assist the Jockey Clubs in their efforts to improve the breed of horses by giving annually three plates of the value of one hundred guineas each to be competed for at Capetown, Kimberley, and Port Elizabeth by horses bred in South Africa.

Other countries may compete and beat us out of the field with wool and mohair, and ostrich feathers are articles subject to the caprices of the leaders of fashion and consequently liable to serious fluctuations in price; in fact it is within reason to assert that at any moment the leaders of fashion may set their ban upon ostrich feathers and thereby effectually crush the industry. A large and continuous demand exists for good horses, and no country in the world is better adapted for their breeding, nor anywhere can they be reared more economically than in the Cape Colony, where the dreaded disease of roaring is unknown and horse-sickness seldom prevails. In a well-regulated stud I question if the last-named disease would ever be heard of.

A great and profitable industry is horse-breeding, and it only wants opening up to become a source of wealth to the country generally, and in the interests of the people it behoves the Government to encourage the industry by every means in its power.

[NOTE.—Colonel Curtis writes: "I return the essay. I think there is nothing to be added to the very full report which it contains and the excellent suggestions which are offered. As far, however, as the General's and my memory serve, the 10th Hussars, when they landed in India, were mounted on Arab stallions, and, to the best of my recollection, the 12th Lancers also."

Mr. Blake says: "In Sir Benjamin Durban's time Colonel W. Havelock bought, through me, a number of Cape horses which were sent to Bombay. In 1846 I bought about 400 horses *in a week* for the Kaffir war. In both cases most of the horses were *very fine*. A great many of the horses sent to the frontier were afterwards taken to India and highly approved of there. Up to a comparatively recent period it was not difficult to obtain a large number of good horses in the hoggeveld and other parts. Many of the large farmers in the Western Province in former times had as many as 300 mares. I attribute the falling off to the slackening demand shortly after the period spoken of by the author owing to deterioration in quality and the pastures being taken up for the more profitable business of merino sheep farming, causing farmers to neglect this important branch of farming. There can be no doubt that this is *a great horse country* and might produce any number of good horses. If time would permit I could add a good deal more about the early days of horse-breeding at the Cape."]

Plant Poisons—II.

By Joseph Burtt-Davy, F.L.S., F.R.G.S., etc., Government Agrostologist and Botanist (Transvaal).

(*Continued from page* 92.)

Human Poisons.

Many cases of supposed criminal poisoning with vegetable poisons, especially among natives on the Rand, have been investigated by the police, and samples of roots, etc., found on the suspects have been submitted to the Division of Botany for examination and report. Few clear cases of the criminal use of known poisons have yet been brought to our attention, the evidence having been always more or less circumstantial and incomplete.

It is difficult to secure information as to the knowledge of poisons among the natives. Intelligent men, born and bred in the country and thoroughly familiar with the Kaffir and his ways, admit that though the Kaffir doctors make use of vegetable poisons the knowledge is kept so secret that white men have been unable to obtain it.

Alysicarpus vaginalis.—Some time ago I received from Dr. Penny, of Pigg's Peak, Swaziland, twigs and leaves of a plant suspected of having been used in a case of criminal poisoning; the foliage indicated that it might be an Alysicarpus and recent comparison at Kew has enabled me to identify it as *Alysicarpus vaginalis.* Although this plant is extremely common in cultivated lands and in villages throughout tropical Africa, and has often been collected by travellers, I can find no record that it is known to be poisonous. I am informed that analyses have not given any result indicating the presence of a poison.

Acokanthera.—Another specimen, submitted by the police, was a root supposed to have been used for criminal poisoning by a native on the Rand. As it did not agree with any material in our collection, it was submitted to the Royal Botanic Gardens, Kew, for comparison with roots of *Acokanthera venenata,* which Professor MacOwen has described as the best-known poison familiar to the South African native. The Kew authorities reported that the structure of this root "appears to be identical" with that of Acokanthera, but, as the Director of the Imperial Institute points out, it is impossible to be certain of the identity of the plant from this evidence alone. As the police were unable to provide material better suited for identification, the matter remains *in statu quo;* it may be stated, however, that *Acokanthera venenata* grows in the Transvaal, and that the root and bark have long been used in Zululand and Natal as a source of arrow poisons. At least two other African species of Acokanthera are used as arrow poisons. The most important of these is *A. Schimperi,* of which the Imperial Institute reports that it contains a crystalline

glucoside, exerting the characteristic physiological action of the plant, which is very similar to that of *Strophanthus hispidus*, in fact no essential difference has been observed between the effects produced by it and those due to the latter plant.

Strophanthus.—A species of Strophanthus is not uncommon in the forests of the Drakensberg, and I am informed by natives that it is sometimes used to poison assegais. This is not unlikely to be the case, for on the East Coast the Wanika arrow poison is said to be prepared from the roots of a species of Strophanthus, either *S. Kombe* or *S. hispidus*.

Ricinus communis.—A few cases of human poisoning from eating Castor bean seeds have been reported.

Nerium Oleander or Ceylon's rose.—The use of oleander hedges for South African gardens is a source of danger to children, who like to gather the ornamental flowers, and may, not unnaturally, put the stems in their mouths, with deleterious results.

Solanum pseudo-capsicum, the Jerusalem cherry, is another favourite garden plant which is a source of danger. It is not infrequently found in a semi-spontaneous condition as a " garden escape ".

Tephrosia.—Mr. Medley Wood states that the roots of *Tephrosia macropoda* have been used as a fish poison by the natives of Natal. The roots of *T. toxicaria* of the West Indies, and *T. virginiana* of North America, are used for the same purpose.

INDIRECT HUMAN POISONS.

The milk of cows which have fed on poisonous plants in insufficient quantity to affect them seriously, may have injurious effects on children, and perhaps also on adult human beings and on calves that drink it. Chesnut (1898) cites a case of poisoning (not fatal) by milk from a cow that had eaten *Podophyllum peltatum*. And Duthie (1888) states that the Zamindar of India believe that a semi-intoxicating effect is given to the milk of buffaloes by feeding on Dhaman (*Pennisetum cenchroides*).

A case is reported from California of the death of a four months old baby from drinking the milk of a cow which was believed to have eaten some leaves and flowers of oleander (*Nerium Oleander*) with its hay. The adult members of the family who drank the milk were also made ill by it. The evidence against the oleander is in this case only circumstantial; but the poisonous nature of the plant is beyond question.

By some vegetable poisons the flesh of the animal killed is tainted, and perhaps rendered unfit for food. The bitter principle in milk and meat sometimes met with in the Southern United States is generally believed to be due to the fine-leaved sneezeweed (*Helenium tenuifolium*), a plant which is very poisonous when eaten in quantity (Chesnut, 1889). But some poisons (e.g. Abrin) when applied subcutaneously do not injuriously affect the flesh, which is eaten with impunity, nor do the fish poisons used by natives have any deleterious effect on the flesh.

The honey produced from the flowers of *Azalea pontica*, in Erzeroum, is said to be poisonous (Kew Guide, 1886), and Distant reports a case of poisoning from honey in the Waterberg District of the Transvaal, supposed to have been produced from the flowers of *Euphorbia* (*Cooperi?*). The honey obtained from *Euphorbia marginata*, Pursh., of North America, is also said to be poisonous.

THE EFFECTS PRODUCED BY POISONS.

The various poisonous principles may act in different ways on the animal system. They do not all attack the same organs even when taken through the mouth into the intestinal tract. Some directly affect the heart, and others the liver; some act on the brain or spinal cord, producing partial or complete paralysis, while others injure the blood. But by far the largest number of poisons are acrid and irritating, producing enteritis in the digestive tract, which may or may not be sufficiently acute to cause death. Some are merely acrid and vesicant. There is thus every degree of poisonousness in plants, from the extremely powerful poisons such as that of the Gift-blaar (*Dichapetalum cymosum*) down to those which merely produce irritation, such as the hell-fire bean (*Mucuna coriacea*) or the stinging nettle (*Urtica urens*).

Some poisons, such as *Dichapetalum cymosum*, act quickly on the system; others are slow in action or cumulative, such as *Crotalaria burkeana*.

The differences in symptoms produced are chiefly due to the difference in chemical composition of the several poisons, among which there are alkaloids, gluco-alkaloids, glucosides, saponins, resins, acids, acrid juices, etc.

In suspected cases of poisoning it is useful to know which chemical substances produce certain symptoms, and also what plants contain those particular poisons or others closely related to them and likely to produce similar effects. Unfortunately, precise knowledge on these points is still very meagre, except as regards the leading poisonous plants of Europe and North America, and it is particularly deficient in South Africa. This being the case, the following notes are not confined to South African plants but will refer also to those of other countries, some of which may throw light on our problems by way of analogy.

POISONS WHICH ACT ON THE BRAIN.

The symptoms produced may be of three sorts, and the substances which produce them are termed respectively narcotics, deliriants, and inebriants.

Narcotics.—These produce giddiness, dimness of sight, contracted pupils, headache, noise in the ears, confusion of ideas, and drowsiness, passing into insensibility. The alkaloids, morphine and thebaine, produce these symptoms.

Deliriants.—These produce spectral illusions, delirium, dilated pupils, thirst, and dryness of the mouth and inco-ordination. Occasionally, though rarely, there are paralysis and tetanoid spasms. The plants which produce these symptoms contain, among other things, the alkaloids daturine, hyoscyamine, mandragorine, atropine, trigonelline, cocaine, muscarine, and agaricine; the gluco-alkaloid solanine; the glucoside picrotoxin; and the volatile oils, borneol and cannabinon.

Inebriants.—These produce excitement of the cerebral functions and of the circulation, loss of power of co-ordination and of muscular movements, with double vision, and lead to profound sleep and deep coma. The plants which produce these symptoms contain piscidine (an alkaloid), pinene and australine (terpenes), santonin (a neutral principle), and absinthic acid.

POISONS WHICH AFFECT THE SPINAL CORD.

These act as convulsants, producing the symptoms of clonic (intermittent) spasms, extending from above downwards, opisthotonos very violent, but trismus (lock-jaw) rare, swallowing spasmodic, death usually in less than three hours or rapid recovery. The plants which produce these symptoms contain the alkaloids brucine, curarine, strychnine, and probably others.

POISONS WHICH ACT ON THE HEART.

These may be either depressant (sedative) or asthenic (weakening).

Depressants produce vertigo, vomiting, abdominal pain, confused vision, convulsions, occasional delirium, paralysis, syncope, and sometimes asphyxia. The plants known to produce these symptoms contain the alkaloids coniine, emetine, eserine, lobeline, nicotine, pilocarpine, and sparteine.

Asthenics produce numbness and tingling in the mouth, abdominal pain, vertigo, vomiting, purging, tremor, occasional delirium, paralysis, and dyspnœa, ending in syncope. The plants which act as asthenics contain the alkaloids aconitine, delphine, oleandrine, incine, antiarine, veratrine, colchicine, and gelsemine; the glucosides æsculin, scillain, scillitoxin, echugin, convallamarin, tanghinin, digitalin, strophanthin and cimicifugin; the organic acids oxalic and hydrocyanic; and the volatile oil of baneberry.

POISONS WHICH ACT AS IRRITANTS.

These are classified by Guy and Ferrier as (1) purgatives; (2) abortives; (3) irritants with nervous symptoms; (4) simple irritants (not dangerous); (5) irritants only if taken in large quantities.

Purgatives.—Symptoms: Abdominal pains, vomiting and purging, cramps, strangury, and tenesmus, followed by collapse and sometimes accompanied by drowsiness and slight nervous symptoms. The plants which produce these symptoms contain, among other substances, the glucosides cathartic acid, colocynthin, convolvulin, jalapin, euphorbin, mallotoxin, helleborin, linin, chrysarobin, and arnicin; the alkaloids ricinine, jervine, and berberine; the organic acids valerianic, crotolinic, and rheotannic; oil of plumbago and crotonal; the resin cambogin, and the substances aloin, elaterin, euphorbin, podophyllin, and plumbagin.

Abortives.—Symptons: Nausea, vomiting , stupor, polyuria, sometimes tenesmus, coma; abortion may or may not occur. The plants known to produce these symptoms contain, among other things, the alkaloid cornutine; the glucoside ergotinic acid; oil of rue and oil of savin; and the organic acids euodic and sphacelinic.

Irritants, with Nervous Symptoms.—Symptoms: Abdominal pain, vomiting, and purging, dilated pupils, headache, tetanic spasms, occasional convulsions, sometimes rapid coma. The plants classed under this group contain the following, among other substances, the alkaloids cicutine, cynapine, taxine, cytisine; the glucosides œnanthin and paradin: the terpene phellandrine, and the oils of cicuta, yew, and euphorbia.

Simple Irritants (not dangerous).—Symptoms: Burning pain in the throat and stomach, thirst, nausea, vomiting, purging, tenesmus, dysuria, dyspnœa, and cough occasionally. Death may occur through shock to the system, convulsions, exhaustion, or starvation due to

injury to throat and stomach. A few (e.g. Urera) cause smarting pain on contact with the secretions of the glandular hairs, which is quickly followed by erythema and urticarial rash, which slowly subsides.

The plants classed under this group contain the following substances: The alkaloids imperialine, clematine, fumarine, glaucine, rhæadine, chelidonine, chelerythrine, buxine, and buxidine; the glucosides anemonin, adonidin, bryonin, ligustrin, ligustron, asarin, saponin, smilacin, inulin, arnicin, arbutin, euonymin, frangulin, gratiolin, polygalin, iridin, crocin, euphorbin, and chrysarobin; the organic acids chrysophanic, valerianic, formic, and mezerinic; the oils of jonquil, anemone, bay, valerian, hound's tongue, snapdragon, and euphorbia; and a number of peculiar acrid juices differing according to the several plants which produce them.

Irritants only if taken in Large Quantities.—Symptoms: Burning pain in throat and stomach, vomiting, purging, difficulty in swallowing, usually followed by recovery. The few plants classed under this head contain the alkaloids capsicine and piperine, and the oils of ginger, horse-radish, and mustard.

(To be continued.)

The Jointed Cactus.

INQUIRIES having been made as to the appearance and identity of the jointed cactus (*Opuntia pusilla*, Haw.), the following notes by Dr. E. Nobbs are reproduced from the late *Cape Agricultural Journal*:—The much abused prickly pear has at least some use as a famine food, but its relative, the jointed cactus, is absolutely without any redeeming feature, and is of the two the greater evil, though the smaller. *Opuntia pusilla*, Haw., is technically and aptly described as one of the pin pillows. Indeed the joints are very like pincushions, but for the notable difference that the points, not the heads, stick outwards. This cactus, nearly related to the prickly pear, has, as compared to them, quite a different habit of growth, being much smaller and creeping flat along the ground, seldom rising two or three feet into the air. The joints, which are only about the size of a man's thumb, are narrow and elongated, and only slightly flattened. It frequently starts in the shelter of some bush, whence it rapidly spreads in all directions. Each joint is armed all over with long barbed spines, and it clings so tenaciously to anything that comes in contact with it—such as an animal's foot or muzzle—that the joint breaks off and may be carried a long distance before being dropped. And where it falls it grows again readily. Not only does it cover the land to the exclusion of edible herbage, but it injures stock by causing much pain when it happens to catch their muzzles or eyes or becomes fixed in the feet.

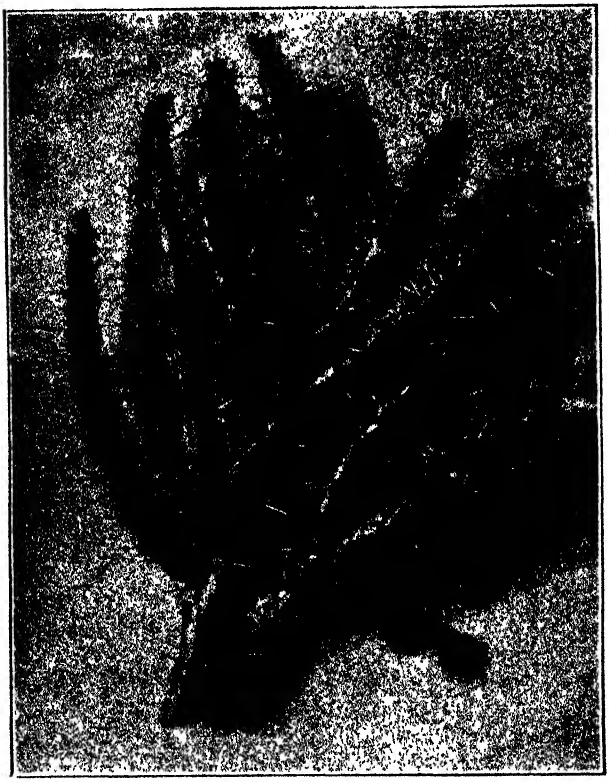
In this way it gets carried all over the veld and from one district to another. Less conspicuous than the prickly pear, the jointed cactus is spreading rapidly, and its presence is often unnoticed until it is already beyond control.

The origin of this pest is particularly interesting, and was given in evidence before the recent Select Committee of the House of Assembly appointed to inquire into prickly pear and jointed cactus by Mr. Leonard, of Prospect, Bedford, in the following terms:—"I will give you the history of its introduction. In the front garden of a house belonging to a neighbour of mine. Mr. Botha (the house was formerly occupied by Mr. Pohl), was a flowering cactus plant. Mr. Botha, however, soon came to the conclusion that it was a useless plant, and, taking it out, threw it into the river. This was in 1874. Shortly afterwards we had heavy rains in the district, the rivers overflowed, and in that way the plant was spread down to the river's mouth. All the farms below mine have cactus."

The farm referred to is Goliah, Wagen Drift, on the Kaga River, Bedford, though whence the prickly cactus came and how it reached that farm remains unexplained. From there it has spread far and wide, and is now to be found in any of the following districts:—Albany, Alexandria, Bathurst, Bedford, Cradock, Fort Beaufort,

Humansdorp, Kingwilliamstown, Peddie, Somerset East, Stockenstroom, Uitenhage, Victoria East, and probably in others from which it has not yet been reported.

Dr. Marloth called attention to the plant in 1892. Periodically the subject arouses public attention, but no satisfactory method of coping with the plague has yet been found. It is true that on the Uitenhage commonage a very heavy application of arsenite of soda to



Typical Specimen of Jointed Cactus.

the growing plants proved fatal, but it still remains to be seen whether this is practicable on a large scale. Arsenic is a costly specific, and one not safe to use too freely. The surest method of eradication is to dig the thing up, pile in on to bushes, and apply arsenite of soda just as is customary with prickly pear, but in carrying out this work there is every likelihood that fragments will be broken off; and as these are small and readily disappear from sight, especially in newly-dug ground, it is hardly possible to clear land in one or several operations. This is quite different from the case of prickly pear with its big bright green joints that can hardly get out of sight.

There are strong reasons against declaring the jointed cactus a noxious weed in terms of Act No. 40 of 1889, although this step has in certain cases been taken. The great cost and labour involved also place eradication beyond the power of many landowners. For this

reason the proposal has been made that badly-infested areas should simply be fenced off and all stock excluded, and of course the spread across the fence line rigidly prevented. Unsatisfactory as such a plan obviously is, it has yet much to commend it, especially on the score of cheapness. Buck, hares, and *homo sapiens* would have to be watched, and constant inspection would be essential.

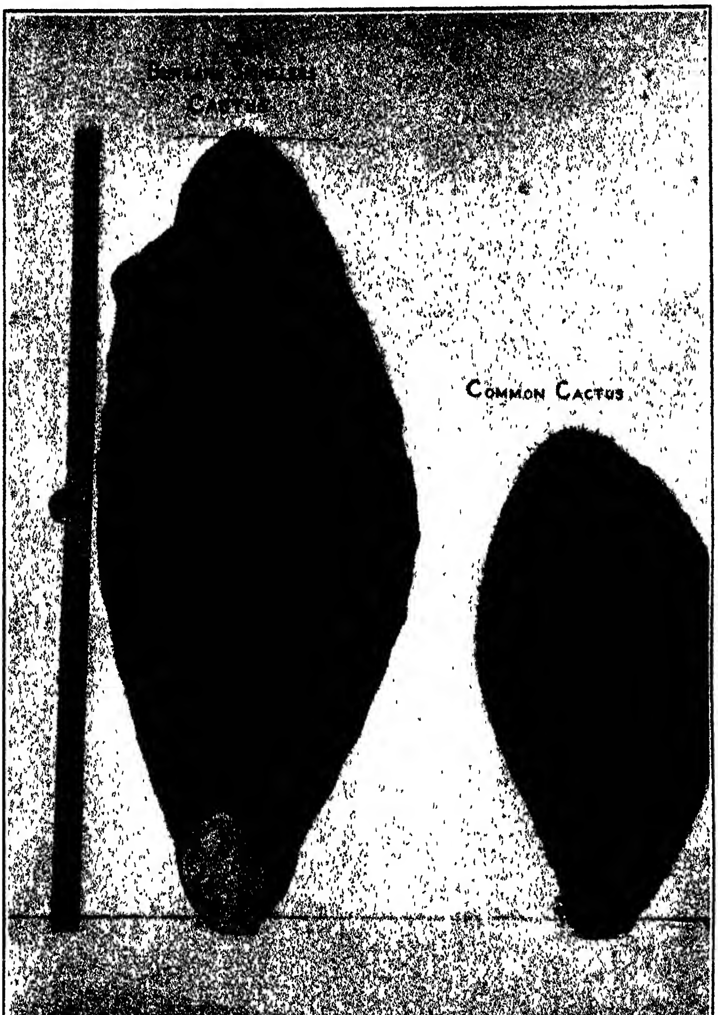
Experiments are at present in progress to try to find some practical means of destroying this insidious foe. Meantime farmers would be well advised to keep a sharp look-out for the plant and nip it in the bud.

Note on Burbank's Spineless Prickly Pear.

By J. Lewis, Senior Chemist, Grahamstown.

Through the courtesy of Mr. R. J. King, of Grahamstown, an opportunity has recently been afforded of observing the growth and food value of Burbank's Thornless Cactus, "Santa Rosa".

Cuttings were imported from California in 1909 and propagated by Mr. King in his nursery at Grahamstown. The plants were grown in a sandy loam soil on a hill slope without irrigation. As the accom-



panying photograph of a two-year-old growth show, the plant is a rapid grower and of erect, sturdy habit, the "leaves" are large and thick (the largest "leaf" photographed weighed 7¼ lb.), and when mature are almost absolutely smooth, with the exception of a few isolated short spines which readily brush off and are in no way an inconvenience to stock feeding upon them. Six such spines were obtained from the large "leaf" above.

The plant, in common with other prickly pears, will grow readilv in districts of moderate rainfall where the winter temperatures do not fall much below the freezing point.

"The prickly pear plants are adapted to a region having a considerable rainfall too irregularly distributed for ordinary crops. They must have water to grow, and considerable of it. They are the camels of the vegetable world. They must have water, but they can get along for long periods without it."*

The following analysis was obtained in this laboratory on an average sample of four "leaves" obtained from Mr. King.† An analysis of one "leaf" by Professor Jaffa of the State University, California, is appended for comparison:—

	GRAHAMSTOWN. Per cent.	CALIFORNIA. Per cent.
Moisture	92.25	94.70
Proteids	.61	.66
Fat	.14	.05
Digestible Carbohydrates . .	4.31	2.88
Crude fibre	1.22	.75
Ash	1.47	.96

These figures do not differ materially from the analyses of ordinary spiny varieties.

Owing to its large percentage of water the plant has a low food value, and a ton of green lucerne would be equivalent to three to four tons of prickly pear. The advantages of the pear as a feed lie in its palatability, its comparatively high percentage of mineral salts and the water it can supply to stock at periods when other green foods are unobtainable.

* Bulletin No. 140, Bureau of Plant Industry. United States Department of Agriculture.
† Analysis by Mr. E. V. Flack, Government Analyst.

Forestry for Farmers.

By G. A. Wilmot, District Forest Officer (Cape Province).

A series of elementary lectures in forestry, which may be better described as a course in tree-planting for farmers, forms part of the curriculum of the Elsenberg Agricultural School (Cape). The course consists of six lectures extending over a period of six days, each day being divided into two parts—class-work in the forenoon and practical field-work in the afternoon. It has been the writer's privilege to give this course, and judging by the students' attention at lectures and zeal in the field it is evident that the opportunity of acquiring a general knowledge of tree-planting is appreciated. The following is the outline of the course:—

First Lecture.—The various requirements of trees.

1. Climatic requirements:
   - (*a*) Heat.
   - (*b*) Light.
   - (*c*) Moisture.
   - (*d*) Wind.
2. Soil requirements:
   - (*a*) Physical conditions—depth and porosity.
   - (*b*) Physiological conditions—chemical composition.

Second Lecture.—The life of a tree and kinds of trees.

1. Development of trees:
   - (*a*) Manner of growth—function of the roots, stem, and crown—Concentric rings.
   - (*b*) General form and shape of trees; varying according to species and conditions.
   - (*c*) Growth in height, diameter, and volume.
   - (*d*) Reproductive power of trees—seed, suckers, cuttings, layers.
2. Kinds of forest trees:
   - (*a*) Evergreen and deciduous trees.
   - (*b*) Softwoods and hardwoods.

Third Lecture.—Formation of forests.

1. Preparation of the ground:
   - (*a*) Sowing—season to sow, manner of sowing, quantity of seed.
   - (*b*) Planting—season to plant, size of plants, manner of planting, distribution of plants.
   - (*c*) Forest nursery work (raising plants).

Fourth Lecture.—Tending forests after formation.

- (*a*) Cleaning.
- (*b*) Pruning.
- (*c*) Thinning.
- (*d*) Felling.

Fifth Lecture.

1. Objects of tree-planting:
   (*a*) Windbreaks.
   (*b*) Shade and shelter for sheep and cattle.
   (*c*) Prevention of sluiting.
   (*d*) To procure rough building and box material
   (*e*) To produce a constant supply of fuel.
   (*f*) Fodder for animals.
   (*g*) Decorative purposes.
   (*h*) To generally enhance the value of property.
2. Effect of forests upon moisture and soil.
3. Forest protection:
   (*a*) Against fire.
   (*b*) Against animals.
   (*c*) Against plant diseases.
   (*d*) Against man (theft, trespass).

Sixth Lecture.—Wattle growing for tannin bark.

(*a*) Kind of wattles—black wattle, pycnantha, and saligna.
(*b*) Regions in which different kinds of wattles thrive.
(*c*) Preparation of the ground.
(*d*) Sowing—quantity of seed, espacement of rows.
(*e*) Cultivation.
(*f*) Thinning.
(*g*) Catch crop.
(*h*) Final crop—season to strip, manner of stripping, treatment of bark, quantity per acre.

Practical Work.

The field-work consists in sowing tree seeds, planting young trees, attending to old plantations, and laying out avenues and parks.

By way of illustrating the above course, the following more extended notes of Lectures 1 and 3 are appended:—

LECTURE 1.—GENERAL REQUIREMENTS FOR TREE-GROWTH.

Each species of tree makes its own special demands on the factors in nature upon which tree-life depends, and these requirements are very varied and distant. Some trees live only in cold regions, while others must have great warmth to succeed. Some of them stand on the boundary of tree-growth within the Arctic Circle and others grow only in tropical lands and are unable to resist the lightest frost. Between these extremes a large number of species exist which vary in their needs only slightly.

Every tree may be said to have its "optimum locality"; that is to say, conditions of environment under which it grows to perfection.

Conditions exist under which certain species of trees luxuriate; or the conditions may be such that the same species thrive only moderately well or grow to but an ill-shapen and stunted form; or again the tree may fail to grow at all owing to the conditions being entirely unsuitable.

Hence, it becomes necessary to study in a general way the factors in nature which govern the growth and development of forest trees. For the sake of clearness these may be divided under two main heads; climate and soil.

Under climatic requirements we will consider the bearing of heat, light, moisture, and wind towards trees.

(*a*) *Requirements of trees for heat.*

When we have stated the fact that heat is essential for the phenomenon of growth, there is little of further importance to the practical tree-planter to be said on this subject. It is always the highest and lowest temperature, rather than the average, which decides where a tree will grow. Each tree varies in the limit of cold or warmth it will endure. Extreme cold more often decides where a tree will not grow than extreme warmth.

And in parts of this country where occasional sharp frosts occur, it is important to ascertain to what extent a tree is frost-resisting.

Sufficient heat is necessary for transpiration which in turn is necessary to cause the circulation of the sap bearing in solution the various plant foods. When the degree of heat is so reduced that transpiration is no longer possible, growth will cease and the tree remain inactive until sufficient heat returns. If a tree belongs naturally to a region where cold never occurs, it will not only become inactive or dormant during a period of cold, but the nature of its internal structure is such that it is killed. In this way temperature has a great deal to do with the distribution of trees over the surface of the whole earth.

The heat required by trees for transpiration and growth is supplied by the atmosphere, either directly or through the soil. The sun is the only important source of atmospheric heat, hence the temperature of any given locality depends in the first place upon its latitude, that is its distance from the Equator. Latitude may be, however, compensated for in many ways.

For instance, a region lying right on the Equator may be cool owing to extreme elevation or to the presence of extensive sheets of water. Or again, the temperature of one particular locality may vary according to its aspect and slope. For example, it will be observed that, generally speaking, the southern sides of a mountain range will be cooler than the northern, and a steep grade on which the rays of the sun strike at right angles will be warmer than a gentle slope or the level. Such considerations must be borne in mind when a site for tree-planting is to be selected or trees are being chosen for a given site.

(*b*) *Requirements of trees for light.*

The light of the sun is everywhere so abundant that we sometimes forget that without it there can be no growth. It is by means of light in contact with the green colouring matter (chlorophyll) in the leaves of trees that the carbon dioxide is decomposed. Thus the plant food which is taken in through the roots and conveyed in the sap through certain channels (the xylem) to the crown of the tree is assimilated, and returns down the stem through other channels (phloem) to build up new tissue.

During the process of germination light is not required, because the embryo is developed by means of substances deposited in the seed. Nor does the first start of growth in spring require much light as it is done by means of reserve materials deposited in certain parts of the plant in autumn. But as soon as these substances, both in germination and the first awakening in spring, have been consumed, light becomes necessary for the elaboration of new food materials. Thus

a forester by planting trees close together is able to cut off the light from the side of the trees and so prevent the growth of lateral branches and promote growth on the top where there is light. Tall straight trees without branches are thus produced and nature has done its own pruning. On the other hand if large spreading crowns are desired for shade and ornament the trees are planted further apart so that each tree enjoys the full light and the trees become heavily branched.

Each species of tree, however, varies in its light requirements. In some cases too little and in others too much light can interfere with the phenomenon of growth.

The forester makes studies of light to discover the normal light requirements of any particular tree he wishes to plant. But it must here suffice to say that trees are divided into light-demanding and shade-bearing species. Light-demanders must always be given the full enjoyment of light, while shade-bearers will grow under the partial shade of others. A further class is sometimes recognized, namely, shade-demanders, that is, trees that fail to grow in the full light.

Light is therefore an important factor in giving form and shape to a tree. Many of you will have noticed how vigorous and well-developed is a tree on the side exposed to the light, and how ill-shapen and stunted is the growth on the side subjected to shade.

Upon this principle of light depends the distance trees must be planted apart, according to the shape of tree desired, as well as the subsequent time and manner to thin out the trees some years later.

(*c*) *Requirements of trees for moisture.*

Without water tree-growth is impossible. The temperature may be normal, light abundant, and the soil perfect, but in the absence of moisture the roots cannot take in food, there can be no flow of sap up to the crown to be there elaborated in the light, nor can the necessary transpiration take place. Thus it would be futile to attempt to plant trees in any portions of the dry Karroo, even though the soil, heat, and light are sufficient.

As we look over the earth's surface we find forests do not exist in regions where the rainfall is lower than 18 inches, but usually only where the rainfall is a great deal higher than that do luxuriant natural forests occur. It may be said that forests are a consequence of an adequate rainfall, but it is by no means proved that forests are the cause of increased precipitation. What foresters do claim in this respect is that forests are capable of conserving the moisture that does actually fall. But this question forms a lecture in itself under the heading of the effect of "Forest vegetation upon climate."

The forester when planting *en masse* for timber production satisfies himself that the rainfall is sufficient for that particular species of tree. He finds it impracticable as a rule to depend upon irrigation. The farmer may, however, be able to establish small plantations in parts of this country where there is a small rainfall by irrigation, but unless he intends to irrigate it will be a waste of money to plant trees and expect them to grow to their full development where the rainfall is lower than 18 inches; unless, as we shall see under the next heading, the soil is of such a nature that it is capable of compensating for the low rainfall by its capacity for conserving moisture.

(*d*) *Requirements of trees for soil.*

We may consider soil from a physical and physiological point of view. The latter, though of some importance, has not the same great influence upon tree-growth as the former. It is to the physical conditions of the soil more than to its chemical composition that attention must be paid. A suitable depth and porosity is essential, while if these are present the chemical composition will be of secondary consideration, except, of course, in the case of excessive salts, lime, or other deleterious factors.

Depth of soil is necessary to give stability to the roots to afford a larger supply of mineral plant foods, but more important still to hold a large and continuous supply of moisture. In this country our rain does not as a rule fall all the year round, but rather at certain (or uncertain) seasons.

In the east and north it is in the summer months, and in the west and south-west in the winter months. A good depth of soil will be able to hold moisture in reserve for the dry months.

A suitable porosity is necessary to allow the free passage of oxygen to the roots and to permit the entrance and percolation of water. If a soil is too compact, as clay, neither water nor air can enter. If on the other hand soil is too porous, as sea sand, water will pass through it as a sieve, and it will be incapable of retaining moisture for the dry periods. An intermingling of fragments of rocks and boulders is often rather beneficial than a disadvantage to tree-growth. The rocks assist in preventing the wash of soil, they retain moisture and keep the soil cool, while the roots of the trees will always find their way through the interstices and round and under the rocks.

Thus the bottom lands can be retained for agricultural crops, while the unploughable hillsides and mountain slopes may be devoted to forest trees.

(*e*) *The Effect of Wind upon Forest Trees.*

Wind is both beneficial and harmful to forest trees. It is beneficial in as much as the motion of the atmosphere ensures a proper distribution of moisture, carbon dioxide, oxygen, and nitrogen over the earth. It is, of course, of paramount importance, as without air currents there could be no life. Considering the matter from this point of view is, however, of no practical importance. Nature can be trusted to do her duty in this respect.

Wind affects forest trees injuriously in two ways—

(1) by changing the temperature and degree of moisture unfavourably;

(2) by injuring, breaking, bending, or uprooting trees.

In the first place dry winds reduce the moisture while cold winds reduce the temperature and thus interfere with the healthy growth of trees.

Strong winds may break the leading shoots or cause a tree to assume a curved shape, and violent winds may overturn and uproot trees. Strong prevalent winds will cause trees to be very unshapely by the growth being healthy and well developed only on the leeward side.

These evils can to a great extent be overcome by planting hardy trees on the outskirts of the forest to form a curtain which will prevent the entrance of either dry or cold winds. For the same purpose the

trees are left denser on the edge of the forest when the time arrives to thin out some of the stems in order to increase the light. For similar reasons forests are cut in the opposite direction to the prevailing wind.

SUMMARY OF LECTURE I.

The factors which govern the growth of trees are moisture, heat, light, wind, and soil.

Unless it is intended to irrigate, the rainfall should not be less than 18 inches to produce good healthy trees.

Ascertain whether trees are frost-resisting before planting in cold localities.

Utilize the principle of light in securing shape and form to trees.

Take measures to prevent the injurious influence of wind.

See that the soil is sufficiently deep and porous, capable of permitting the entrance of moisture and air, with a capacity of retaining moisture in the dry season.

LECTURE III.—FORMATION OF FORESTS.

Plantations of trees may be established either by planting or sowing. For both methods, speaking generally, the ground must be equally well prepared.

(a) Preparation of the Soil.

Where possible, the ground should be well ploughed and allowed to lie fallow for six or twelve months in order that the virgin sod may thoroughly rot.

Just before planting or sowing, the ground should be cross-ploughed and harrowed.

Where ploughing is impossible because of surface stones and rocks, owing to the steepness of the mountain side, the natural vegetation can be burned off in the dry season and well picked to a depth of six or seven inches just before planting or sowing.

Good preparation of the area ensures a better germination of the seed, and in the case of plants a more rapid and more uniform growth.

In some cases it is possible and advantageous to take an agricultural crop off the area before planting. This reduces the cost of preparation and keeps the ground free from weeds.

In areas comparatively free of natural vegetation it may be possible to dispense with ploughing or picking, and work the ground only at the spots where the plants are to be inserted. This last method, however, involves great risk of failure, and experience shows that, as a rule, complete working of the soil secures a more rapid formation and is less expensive in the long run.

(b) Season to Sow or Plant.

The best time to plant is just before or during the rain, and, if possible, in the early spring. The season for planting extends over a period of three or four months. In the Western Province it is in June, July, August, and September. The month of August is, however, the ideal time.

In the Eastern Province and the Transvaal the season is later, as the rains fall in summer. It is usually good to wait until one or two heavy rains have fallen so that the ground is well saturated. Planting or sowing may commence in November and continue till

March. Late planting or sowing must be avoided, as sharp frosts are liable to occur in the north and in parts of the east, and very young plants are more liable to suffer.

(*c*) *Methods of Sowing.*

The sowing may be done either in rows or broadcast. It is usually better not to harrow after sowing as there is a danger of the seed being buried too deep. In most cases it is best to leave the seed on the surface, just as nature does when seed is blown from the parent tree. If scorching is feared or the plundering of birds, the area may be lightly gone over, after sowing, with bushes or rakes.

Broadcast sowing gives a uniform even forest, which later on ensures an even distribution of the light. Sowing in rows has the advantage of saving seed and of its being possible to cultivate after germination.

On the whole the best forests have been established in this country by broadcast sowing.

Sowing is less costly than planting when the seed is cheap, such as cluster pine. If seed is very costly or if the grains of seed are too minute to be well sown, plants must first be raised in a nursery.

Great care should be taken that the seed is evenly sown over the area. If the seed is badly sown the trees will be in clusters while parts of the ground will be bare. The result will be that the forest will be too dense in places and too open in others.

The quantity of seed to be sown to the acre varies with each species, the nature of the soil, and according to the vermin which is likely to feed upon the seed.

A poor germinating soil must be more thickly sown than a good soil. This is to allow for the seed that does not germinate and to give the soil a denser cover. Or if the area is over-run with mice, baboons, and birds, due allowance must be made for the quantity of seed they will devour. In the case of cluster pine sowings a fully stocked area is usually obtained when 18 to 30 lb. of seed is sown to the acre. If the sowing is done in rows 3 feet apart the quantity per acre may be reduced to 10 to 15 lb.

In the case of wattles 5 to 7 lb. per acre is sufficient.

(*d*) *Method of Planting.*

In planting out, the roots must be disturbed as little as possible, least of all the fine rootlets through which the nourishing substances are assimilated. These fine rootlets are generally embedded in small lumps of earth which should not be shaken off. The least interference with the roots occurs when the plants are lifted with a ball of earth in which the root system is embedded. This can be done with a garden trowel. A hole is first opened in the prepared ground with a spade, trowel, or bush-pick to a depth sufficient to accommodate the longest roots. The soil is then firmly pressed about the roots so that all air spaces are filled, and at the time taking care to keep the plant erect and not to damage the top by pinching.

If the sun is very hot the plant can be advantageously mulched by placing a little grass or some weeds round about it.

The best sized plants are those that are about 4 to 6 inches high in the case of pines, and 5 to 8 inches in the case of gums. A strong healthy plant is one that has a good root system, that is, abundance of spreading roots. The manner of raising such plants will be described under "Nursery Practice".

(e) *Spacing.*

The spacing will depend on the purpose for which the trees are planted, the species and the quality of the locality as to soil and moisture.

Trees for shade and ornament are planted far apart so as to give them the full enjoyment of light. Avenue trees should not be closer than 30 feet so that strong limbed trees may develop. Trees for poles and timber must be planted close so that at an early age the light is cut off, and thus lateral branches, which result in knots and general weakness, may not be produced. In the case of most gums which branch out little the distance between the trees need not be less than 9 to 10 feet. Pines on the other hand must be planted much denser on account of their tendency to branch.

In a plantation the trees may be so arranged as to form squares, rectangles, or triangles.

The last method has probably most advantages. It is easy to set and place all the trees at equal distances from each other. The greatest number of trees can be planted on a given area, and it is the most suitable for warm countries and sandy soils, because it makes the closest cover. The trees thus planted form regular lines in all directions from the point of view of the observer. Represented graphically it is as follows:—

The following table gives the number of trees required per acre when planting at various distances, either on the square or triangle method:—

Distances Apart, in feet.	Number of Trees per Acre— Square Method.	Number of Trees per Acre— Triangular Method.
3 by 3	4840	5397
4 by 4	2722	3036
5 by 5	1742	1943
6 by 6	1210	1349
7 by 7	889	991
8 by 8	680	759
9 by 9	538	600
10 by 10	436	486

The "Humphrey" Gas Pump.

A NEW TYPE SUITABLE FOR LIFT IRRIGATION, ETC.

THE "Humphrey" Gas Pump was discussed at the recent Irrigation Congress, and few present seemed to know much about it. The following particulars from the *South African Mining Journal* should prove of interest. The Sandycroft Foundry Co., Ltd., of Chester, England, is placing the pump on the market. The claims made for this particular type of pump are low first cost where large volumes of water are to be dealt with, low running costs, high efficiency, with practically the total elimination of moving parts, the only moving parts of the whole pump being in connection with the valve gear. The "Humphrey" Pump is extremely simple in construction and operation, the explosive force acting directly on the water, so that no rotary fly-wheel or crank-shaft, no solid piston, connecting-rod, bearings, or glands are required, hence the upkeep of such a plant must be necessarily very small, while the attention required during operation is brought down to a minimum.

The mass of water in the pump itself forms what one might term a pendulum, and its movement draws in fresh water, exhausts the burnt products, draws in a fresh combustible charge, and compresses the charge previous to the ignition, so that there is a complete cycle of operations exactly similar to that of a charge of gas in the cylinder of the ordinary gas engine, the difference being that in this case the thermal efficiency of the "Humphrey" Pump is greater than has hitherto been reached by any other heat engine for the reason that the operation follows a cycle in which the expansion of the burnt products is carried to atmospheric pressure. The gas for the operation of the pump is generated in the ordinary type of suction or pressure type of producer as used with the ordinary gas engine, the actual size of plant for the generation of such gas being very much reduced in the case of the "Humphrey" Pump than in the case of the gas engine plant, the difference in size being somewhere in the neighbourhood of 25 per cent. smaller for the "Humphrey" Pump.

It might be interesting here to give a copy of results of tests carried out by Professor Unwin in 1909 at Dudley Port Experimental Station. In his report he says: "The fuel economy is very striking, and, so far as I know, unequalled by any other pumping arrangement."

The following is a summary of the gas and heat expenditure taken from his tests:—

Lift Feet.	Pump Horse-power.	Mond Gas used per P.H.P. hour at 760 m.m. 0° C. cubic ft.	Calorific value of Gas per cubic ft. B.T.U.	Heat expended per P.H.P. hour B.T.U.	Lb. of Anthracite in producer per P.H.P. hour.
32.87	16.15	83.12	147.3	12.243	1.063
25.95	12.32	90.93	143.5	13.037	1.132
20.79	10.99	93.61	145.3	13.596	1.18

In comparing a centrifugal pump driven by a gas engine with the "Humphrey" Pump, Professor Unwin takes a centrifugal pump required to do 16 pump horse-power on a lift of 33 feet, or the same work as the actual "Humphrey" Gas Pump tested. The following are the figures he gives for the gas consumption:—Gas engine and centrifugal pump, 120 to 127 cubic feet of gas per pump horse-power hour; "Humphrey" gas pumping plant, 83.1 cubic feet of gas per pump horse-power hour. These figures are interesting, showing an enormous reduction in running costs in favour of the "Humphrey" pump.

The following description may serve to explain the actual operation of the pump designed for low lifts and suction, the general arrangement of such a pump being shown in the accompanying figure.

The producer plant for this pump is not shown in this figure, as it would be exactly similar to those supplied with the ordinary small suction gas engine.

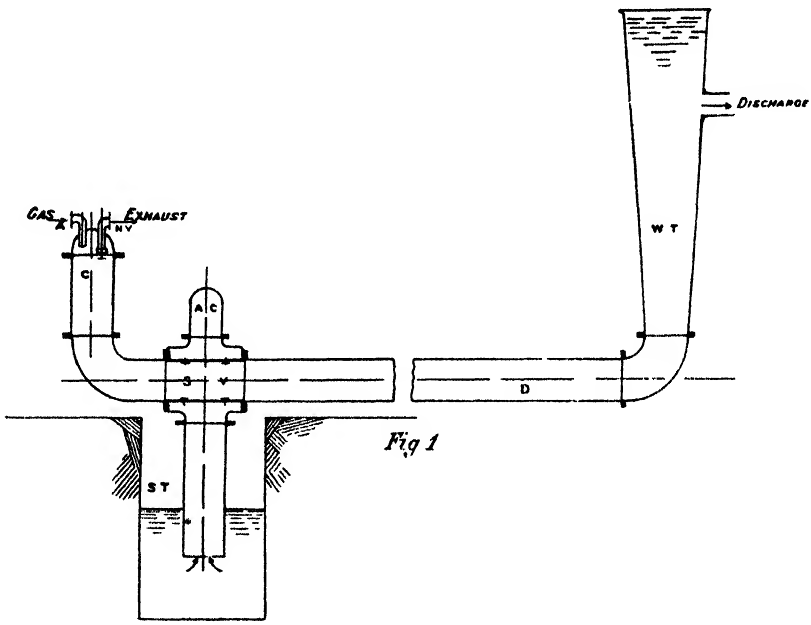


Fig 1

A.—Inlet valve.
E.—Exhaust valve (below N.Y.).
C.—Combustion chamber.
S.—Suction chamber.
V.—Suction valves.
S.T.—Suction tank or well.
D.—Discharge or play-pipe.
W.T.—Water tower.

The cycle of this pump is as follows:—

The explosion of a compressed combustible charge in the upper part of chamber C. (fig. 1), drives the water along pipe D. into water tower (W.T.), and delivered through outlet marked discharge. As the water lowers in C. the exploded gas is expanded down to atmospheric pressure when exhaust valve E. opens; expansion then

continues below atmospheric pressure, and owing to the presence of non-return valve N.Y. in the exhaust pipe it prevents the air from entering chamber C., consequently the lowering of the pressure raises water from tank S.T. through valves V. into suction box S., until the volume of water comes to rest and the suction valves close, the water column then returns towards chamber C., closes exhaust valve E., and brings the column to rest. This compressed gas then starts the column on another outward stroke, the pressure in C. falling to below atmospheric pressure and drawing in a fresh charge of gas and air until the column again comes to rest and starts on another inward stroke, then the gas and inlet valves A. close, and the charge is compressed ready for another explosion to commence another cycle of operations. The ignition of the "Humphrey" pump is timed by a small apparatus which closes the ignition circuit at the point of maximum compression, and an ordinary small battery, trembler coil and sparking plug are employed. The starting of the pump is quite a simple matter, compressed air is forced into the combustion chamber by a small hand pump until the volume of air introduced is rather larger than the actual charge, the exhaust valve is then suddenly opened by a hand lever, the compressed air then escapes, permitting an inward stroke of the water, followed by charging and compression strokes, which on ignition start the pump working regularly. The low lift type of pump is now in operation in England, while designs are being got out for pumps with lifts up to 400 ft., the latter requiring slight alterations in design to that of the particular design of pump mentioned above.

Some Diseases of Poultry.

By R. Bourlay, Poultry Expert (Transvaal).

(*Continued from page* 654, *Vol. II.*)

Heart Bag, Dropsy of.—A complaint of not very frequent occurrence; the symptoms are a staggering gait and the head thrown backwards. Fowls so affected are generally unable to feed, and the best course to adopt is to immediately kill them and thus save them pain and misery.

Jaundice is decidedly common in South Africa, especially in the hotter districts, and numbers of poultry undoubtedly die of this complaint. It is, we consider, generally due to the too continuous use of food which contains too much oil, such as mealies; it is also frequently aggravated by birds being kept in close confinement. In appearance the subject is listless and mopish; the face generally has a yellow tinge which occasionally extends to the comb and wattles. A post-mortem examination reveals an abnormally enlarged gall bladder and frequent discolouration of the adjoining organs.

The treatment consists of an entire change of diet from which all foods of a fatty or oily nature should be excluded; one authority advises purging the birds with ½ to 1 grain doses of aloes, whilst others recommend 10-grain doses each of sulphate of magnesia and bicarbonate of soda daily for four or five days. We have found, however, that if poultry are fed with care and sufficient change of diet is given, together with plenty of green food and a bi-monthly dose of epsom salts, there is not much chance of this complaint making its appearance.

Liver Disease is a general term largely used amongst poultry-keepers, and in the majority of cases the trouble with this organ is due to congestion.

The causes are similar to those of jaundice, lack of exercise being in our opinion a common contributory cause, for we have noticed that, in the case of Anconas, Black Leghorns, Campines, and such light breeds which are very active in their habits and are continually on the move, liver troubles are seldom met with, whereas amongst the heavier breeds, which are by nature more or less lazy and sluggish, it is of frequent occurrence unless such birds can be induced to take plenty of exercise. The symptoms are not very pronounced, but affected birds are usually sluggish, and the droppings are generally tinged more or less with yellow or green. As the disease advances, lameness is often noticeable, and this is usually followed shortly by death. In the treatment the same measure as suggested for jaundice may be adopted; we have also found ½-grain doses of calomel administered daily for two or three days very useful both for liver trouble and jaundice.

Pip can hardly be called a disease for it is usually due to some other organ or organs being out of order, especially the stomach or respiratory organs. The hard horny substance which forms on the tongue causes considerable pain and inconvenience, and one cannot be surprised that the fowls fall off in condition for the hard sharp edges of the tongue make the mouth very sore which prevents the bird from feeding freely.

It is common practice to tear off this scale, which drastic method is quite as painful as the trouble which it is supposed to relieve. The more humane yet quite as effective method is to administer a dose of epsom salts and gently anoint tongue with a little glycerine a few times, after which the scale will either come off itself or can be removed without undue suffering on the part of the patient.

Pneumonia is of far more frequent occurrence amongst poultry in South Africa than is commonly supposed, especially where fowls are provided with no shelter but are exposed to all weathers and sudden changes; we have also seen several instances of this amongst the valuable show birds which have evidently contracted it through exposure on their journey to or from poultry shows. It is also undoubtedly due in certain instances to the inhalation of irritant matter, and we have known several birds dying of this complaint after a particularly strong and continued dust storm, whilst in other instances we have known of several deaths caused by poultry-keepers sprinkling the floors of the fowl-houses in a liberal manner with unslaked lime.

The symptoms consist of rapid breathing, thirst, ruffled plumage, and the birds will either stand with drooping head and wings or squats in a huddled manner.

The disease is so rapid and so frequently fatal that treatment is hardly worth attempting. The bird may be shut up in a warm place, the back above the lungs painted with tincture of iodine or turpentine, and a few drops of spirits of camphor and brandy in milk given at frequent intervals.

The diet must consist of soft food which should be of a nourishing nature; a little chopped liver daily will be of great help.

Scaly Leg is extremely common in South Africa, and there are few yards where some indication of this cannot be observed, especially where poultry are confined in bare runs; fowls which have access to grass are not so liable to this complaint for the moisture seems to check it. It is due to the presence of a small insect which penetrates underneath the scales of the legs causing the unsightly roughness. If taken in time this is easily cured, for in its early stages there is not much difficulty in destroying the parasite.

The simplest remedy is to scrub the legs of the fowl with soft soap and water, dry well, then rub them over with a rag which has been soaked in paraffin oil. It is necessary to repeat the treatment at regular intervals, about twice weekly is sufficient, until a cure has been effected.

White Comb.—The cases of this usually met with are generally due to a parasite, though the term is occasionally applied to a bird which has lost the healthy colour of its comb and face, either through improper treatment or feeding, or through close confinement in dark

quarters, in such cases the remedy is obvious, change the conditions and treat the patient as in the case of anæmia.

When, however, the trouble is due to parasitic causes, no time must be lost, for it spreads very rapidly and only yields to drastic treatment.

The first indication of this disease is usually observed by the appearance of a small patch of white on the comb of the bird, if this is examined closely it will be seen that it consists of a number of white spots about the size of a pin's head, if neglected it spreads rapidly all over the comb, face, wattles, and frequently on to the neck, and if a bird affected with this disease is not immediately isolated it will spread contagion through the entire pen.

We have succeeded in curing this disease by regular applications of cyllin, which should be applied after the comb has been washed well and dried.

Another effective cure is to rub the comb with paraffin oil and then apply carbolic ointment.

Worms are a frequent scurce of trouble to poultry-keepers in South Africa, the birds become weak and listless, walk with an appearance of stiffness, and lose condition generally. The best measures to adopt are to remove them into a small run, carefully clean up and burn all excrements every few hours, whilst a dose of 10 grains of ground areca nut given in milk while the bird is fasting will generally effect a clearance, a second dose may be given two days later, but in the interval care must be taken to see that all droppings are cleared up.

Ground which has been carrying fowls with worms should be well limed and not again used for poultry for several months.

When it is noticed that a bird is out of sorts, do not leave it to recover of its own accord or die, but pick it up and keep it under observation until the trouble has been determined or a recovery effected.

If fresh poultry are bought, do not immediately place them with the other birds unless the yards from which they have been procured are above suspicion; if they have been purchased on the market do not place them in the runs with the other stock under any circumstances, but keep them isolated and under observation for at least two weeks.

Do not buy food for poultry because it is cheap, cheap samples of poor quality are generally the most expensive in the long run, a little good food is infinitely better than a lot of bad.

Do not neglect the fowl-houses; a thorough spraying with strong disinfectant once every month or so, especially during the spring and summer months, will save a great deal of trouble and probably many lives.

See that no decaying vegetable matter is left in the runs.

Do not allow the drinking water to be exposed to the sun; fowls enjoy a cool drink as much as do human beings, and sun-heated water and dirty drinking vessels are always a source of danger.

Do not overcrowd poultry either in houses or in runs; remember that small flocks give better results in proportion than if large numbers are kept together; overcrowding is another way of spelling trouble.

Use every endeavour to keep poultry on the move, give plenty of scratching material, such as stable manure, dry leaves, chaff, etc., and

bury the grain in this; plenty of exercise tends to keep us all in good condition.

Remember that poultry require green food, also that grit must always be before them; a good dust bath must also be always available or lice will become a source of constant irritation to the birds, which cannot be expected to thrive under such conditions.

Look at regular intervals for fowl ticks in the cracks and crevices of the fowl-house, especially during the spring and summer months, and if you do not know how to combat these write for a copy of the leaflet on this subject.

Codling Moth Regulations.

THE attention of fruit shippers and others is again drawn to the restrictions in force on traffic in apples, pears, and quinces in their fresh state. The regulations, which are designed to retard the spread of the codling moth, remain the same as in the latter part of the last deciduous fruit season. A large number of infringements occurred in March and April, 1911, some no doubt due to ignorance of the regulations and others due to indifference to them. The Department of Agriculture requested prosecutions in all cases, and many convictions, some of parties who shipped fruit into the closed areas and others of parties within those areas who received and sold it, were secured and the delinquents fined various amounts up to £10. Practically the whole of the high veld of the Transvaal exclusive of Johannesburg and other main reef towns near it, nearly all of Natal exclusive of coastal districts, and the northern districts of the Orange Free State are closed areas; while the closed area in the Cape Province includes the Districts of Barkly East, Wodehouse, Tarka, Bedford, Albany, and Alexandria and all between those districts and the sea inclusive of Griqualand East and Pondoland and other Transkeian native territories. By consulting the official railway time-table book in connection with the two schedules listed below, a person can readily ascertain whether or not any given station is in a closed area.

The closed area in the northern Colonies includes all railway stations on the

(1) Cape Main Line between Roodewal, Orange Free State, and Natal Spruit, Transvaal.
(2) Fourteen Streams route between Kingswood, Transvaal, and Bank, Transvaal.
(3) Natal Main Line between Hilton Road, Natal, and Roodekop, Transvaal.
(4) Delagoa Bay Main Line between Godwan River, Transvaal, and Wonderfontein, Transvaal.
(5) Johannesburg-Viljoens Drift Branch south of Lawley.
(6) Johannesburg-Machadodorp via Breyten Branch east of Largo.
(7) Zeerust Branch west of Krugersdorp.
(8) Ventersdorp Branch throughout.
(9) Ermelo Branch throughout.
(10) Lydenburg Branch throughout.
(11) Parys Branch throughout.
(12) Heilbron Branch throughout.
(13) Ladismith-Harrismith Line east of Kestell Road, Orange Free State (also station in Senekal and Lindley districts when revised regulations go into force, but not at present).
(14) Maritzburg-Malenge Valley Branch south of Elands Kop, Natal.

(15) Greytown Branch north of Albert Falls, Natal.
(16) Utrecht Branch throughout.
(17) Vryheid Branch throughout.
(18) Weenen Branch throughout.
(19) Upper Tugela Branch throughout.
(20) Richmond Branch throughout.
(21) Stuartstown Narrow Gauge Branch throughout.

Amongst the Transvaal stations that are *not* in a closed area, and to which apples, etc., may still be sent, are Johannesburg, Germiston, Boksburg, and others along the Rand from and including Krugersdorp and to and including Springs, Pretoria, Rustenburg, Pietersburg, and Middelburg, and others on the direct lines of railway between these several points and Johannesburg; and also Christiana, Bloemhof, and Barberton. Amongst the open Orange Free State stations are Bloemfontein and Kroonstad, and stations between them and (at present) from them to and including Bethlehem, and all south and west of Bloemfontein. And amongst the open Natal stations are Maritzburg and Durban and all between them, and also those on the north and south coast lines. Apples, etc., must not be sent from any of these places into a closed area.

The closed area in the Cape Province includes all railway stations on the

(1) Midland Main Line from and including Alicedale to and including Coerney, and also Witmoss and Thorn Grove.
(2) Eastern Main Line south of and including Sterkstroom.
(3) Port Elizabeth-East London Line, via Cookhouse, east of Cookhouse.
(4) Indwe-Maclear Branch.
(5) Butterworth Branch.
(6) Tarka Branch.
(7) Grahamstown Branch.
(8) Alexandria Branch.
(9) Kowie Railway.

Amongst the Cape Province stations that *are in the closed territory* of the Cape, and to which apples, pears, and quinces must not be sent from stations in the Western Province and other parts of the Union are Queenstown, East London, Kingwilliamstown, and Grahamstown.

Amongst the eastern towns of the Cape to which the fruit concerned *may be sent* from any part of the Union are Graaff-Reinet, Cradock, Somerset East, Uitenhage, and Port Elizabeth.

The dispatch of the fruits concerned from any station north of Waku, on the Eastern Main Line, to Waku or any station south thereof is prohibited.

The removal of boxes and other receptacles that have contained apples, pears, and quinces is subject to the restrictions that apply to the fruit; hence the return to a closed area of boxes, etc., that have been used for sending any of the fruits named to a market in an open area is prohibited.

Traffic in the fruits named between the closed area of the Cape Province and the closed area of the more northern Provinces is prohibited except over the Cape-Natal border, where the two closed areas are in contact. It follows that apples, etc., must not be sent from,

say, Grahamstown, in the Cape closed area, to, say, Potchefstroom, in the northern closed area, nor vice versa.

The transport of fruit infested by the codling moth from any one place in a closed area to any other place within that area is prohibited, as is also the sale within a closed area of any fruit infested or which has been infested by the insect.

Caprification of Smyrna Figs.

LECTURE DELIVERED BEFORE PAARL FARMERS' ASSOCIATION, 5TH DECEMBER, 1911.

By I. TRIBOLET, Horticulturist and Viticulturist,
Elsenburg Government Agricultural School, Cape Province.

THE fig is one of the best known, most widely distributed, and most wholesome of fruits, and has been as long cultivated by man as any of the fruits now used by him.

The accounts we have of the growing of figs reach back to centuries before the Christian era. In the fifth century (B.C.) Heredotus writes of the art of pollination; over 2000 years ago Strabo, the geographer, wrote of the figs of the Meander Valley. Aristotle, Theophrastus, and even old Homer mention and have notes on this fruit in various connections. Even if we go back to the very infancy of our race we can assume that the fig was then in use, at any rate we learn that the leaves formed rather an important feature in the dress of our very early parents.

Now, although the fig has been known and cultivated so many thousands of years, there are still points about it that our deepest students and most up-to-date scientists are not yet able to elucidate or satisfactorily clear up.

During the last twenty-five years or so a great many facts of interest and value have been brought to light especially bearing on the matter of pollination and on the different types of figs.

The fig, botanically, is known as a spurious fruit (Syconus), and is a fleshy, partly hollow receptacle, with its flowers and seeds, or real fruit on the inside, and belongs to the tribe Artocarpeœ, genus *Ficus carica*, and is divided by Dr. Eisen into two great classes—

(1) Those which ripen and become edible without developing perfect seeds, or, in other words, they become pomologically ripe, but not botanically ripe.

(2) Those which are unable to ripen or become fit for eating except the formation of perfect seeds takes place.

This class becomes both pomologically and botanically ripe, that is, it can be eaten and also be propagated from the ripe seeds it contains.

To the first great class belong all the figs that have been grown in this country till quite recently. To the second belong all the figs of the Smyrna type; some of these have been introduced here during the last few years.

The initial difference between these two general classes is that the first which can become ripe and fit for eating without pollination

possesses what are known as mule flowers. This class cannot be propagated from seed, but only from cuttings.

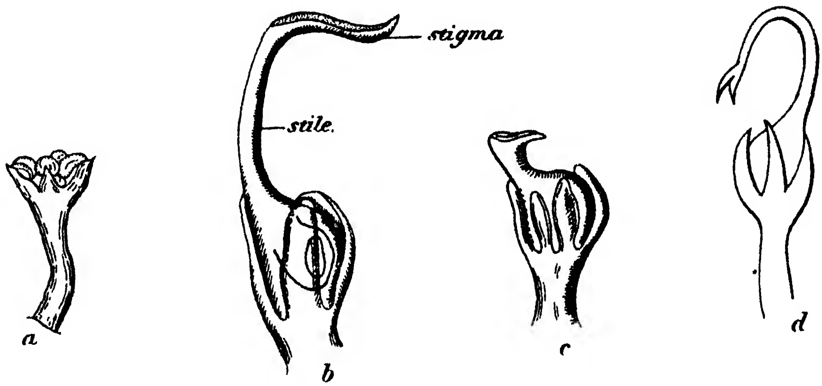
The second class possesses male, female, and gall flowers, becomes botanically ripe, and can be propagated from seeds as well as from cuttings. This class includes the Smyrna type, which contains only female flowers, and which to be of any value must be fertilized. It also includes the Capri, or what is sometimes called the male fig.

Now, the Capri section (which is also *Ficus carica*) possesses male, female, and gall flowers—these gall flowers, as will be explained later on, play a very important part in the economy of the fig.

Thus the two great classes of figs have four distinct types of flowers, each of which has a different purpose to serve.

The flowers, as already stated, are (1) male, (2) female, (3) mule, (4) gall, and vary considerably in shape and size, as may be seen from the drawings.

The male flowers are found occupying about a third of the inside area of the fig, and grow round the ostiolum or eye of the fig, point



towards the centre of the fruit, and are not to be seen from the outside except in the case of abortions or freaks, when they sometimes burst through and grow there.

They, as in the case of other flowers, carry the pollen, and are found in the first and third crops of the Capri figs.

The female flowers occupy, in the Smyrna figs, nearly the whole of the interior, and their office is to receive the pollen, become fertilized and produce seeds. If this fertilization does not take place, the fig fails to come to maturity, and drops off the tree when about half-grown.

The mule flowers are formed throughout the whole of the interior of the ordinary edible fig, are incapable of being fertilized, and are probably degenerate females or gall flowers that have become modified by cultivation.

The figs bearing mule flowers ripen without pollination.

The gall flower is characterized by an imperfect stigma and a shorter style than that of the female flower. It is found in all the crops of the Capri fig tree, and is incapable of being fertilized. It is specially adapted as a receptacle for the eggs of the little wasp (*Blastophaga grossorum*). It is in these galls that the wasp is hatched out and lives till it reaches maturity and is able to undertake the important work of pollination.

CAPRIFICATION.

is the means used for bringing about the fertilization of the Smyrna fig by the transference of the pollen from the male flowers of the Capri fig to the female flowers of the Smyrna fig or figs of that type.

Unlike the flowers of most other plants the fig flowers are enclosed in a partly hollow, fleshy receptacle, and cannot be visited by passing insects, such as bees, wasps, flies, etc., by which the pollen from one flower may be carried to another.

For bringing this about in the fig there is a special insect that is not, as is the case in other flowers, a visitor, but is a permanent resident in the fruit, and so interdependent is this little insect and the fig tribe that it has been said, and truly so, that if this insect were by any chance to die out every fig tree in existence (if the intervention of man in the matter of propagating by cuttings be left out) in a few years would perish off the face of the earth. The converse also holds good: if the fig trees died the insect would be wiped out.

In the case of *Ficus carica*, this little insect is known as *Blastophaga grossorum*, and none of the other *Blastophagas*, of which there are a great many species known, inhabiting a number of different species of *Ficus*, could do the work.

The female wasp to look at is very much like a small black ant, about one-eighth of an inch in length, with wings mostly held at right angles in a vertical direction to the body, which gives her rather a haughty appearance as she struts round after emerging from the Capri fig.

The male is somewhat smaller, and looks much like an ordinary quarter-grown flea with a telescopic ovipositor. His sight is very bad, having only partly developed compound eyes and no ocelli. He never leaves the interior of the fig, but emerges from the gall, in which he has grown up somewhat sooner than the female, and busies himself by going round fertilizing her before she leaves the gall in which she has been bred, so that when she emerges from the fig she immediately sets about looking for another fig in which to lay her eggs.

In making her way out of the eye of the fruit she has to push through quite a tangle of male flowers, and, covered with pollen, she bursts into the outer world and enters any convenient fig, whether it be Capri or Smyrna. If it happens to be the former, she lays her eggs in the gall flowers and soon after dies.

If the latter, she finds no gall flowers, and rushes round in rather an excited state, spreading the pollen grains with which she is covered on the receptive part of the female flowers of the Smyrna fig, which thus becomes fertilized. In her futile quest for a suitable place in which to lay her eggs, she will probably drop one here and there, but soon gives it up and usually dies in the fig.

CAPRI FIG TREES.

For the maintenance of the generations of the little wasps there must be a tree or trees on which there is always fruit, or rather that carry overlapping crops always at a suitable stage for the reception of the insect. These crops must also contain suitable receptacles for the insects' eggs. Such a tree is the *Capri ficus* or Capri fig tree, which bears and brings to maturity three crops in one year. In each of these crops are found gall flowers, which seem to have been specially evolved to suit the breeding peculiarities of the insect,

The three crops borne by the Capri fig tree are:—

1. Profichi crop, which contains gall and male flowers.
2. Mammoni crop, which contains gall and female flowers.
3. Mammei crop, which contains gall and male flowers.

The insects from the profichi crop go into the mammoni crop and lay. Those hatching out from this laying come from the mammoni crop, enter the mammei crop, and lay.

The insects from this laying come from the mammei crop, enter the profichi crop, and lay, and so on, *ad infinitum*, as long as there are figs at a suitable stage for the insects to operate on.

To insure proper overlapping of the crops, it is hardly safe to depend on one variety of Capri tree, so that in practice at least three varieties ripening at slightly different periods are planted.

This also tends to lengthen the period of emergence. Even then from various causes, such as frosts, droughts, etc., sometimes the insects are lost through not having figs to go into. When this happens they must be obtained from somewhere else and re-established in the Capri trees when the next crop is at the right stage.

The time at which this risk is greatest is between the profichi and mammoni crops. Millions of insects emerge early from the profichi crop before there is a sign of the coming mammoni crop on the trees. All these perish, and it is only the insects coming from the very latest profichi that have an opportunity of getting into a few of the most advanced of the mammoni crop.

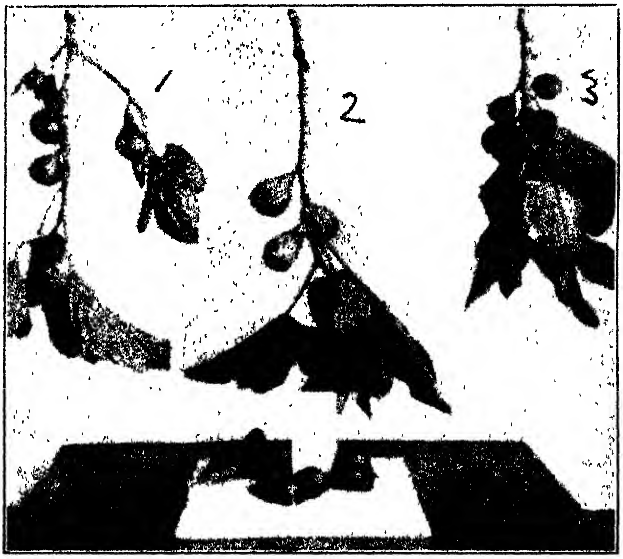
It is only the insects from the profichi crop that pollinate the Smyrnas, and this freak, as it were, is probably a provision of nature, where the male and female trees grow wild and intermingled; for forcing these insects with the pollen from the male fig into the varieties containing only female flowers, and thus causing these fertile trees to become pollinated, but where caprification is carried on artificially and on commercial lines, the ideal tree to have would be one on which the crops would unfailingly overlap. Such a tree is said to have been discovered in an orchard owned by Mr. E. W. Maslin. Among some hundreds of seedlings that he propagated was found, Dr. Swingle says, "a sort of hermaphrodite tree that had enough of the qualities of a Capri fig to support the *Blastophaga*, and enough of those of the fertile fig tree to produce an abundant crop of summer generation buds (mammoni) just as the spring generation (profichi) Capri figs were ripening. By planting this variety among the Capri figs the *Blastophaga* will be able to breed uninterruptedly throughout the year, and not, as now is the case, almost completely die out in mid-summer".

As the wasp likes cool places and shade, the Capri fig trees are usually planted close together, 12 ft. by 12 ft., 10 ft. by 15 ft., or in hedge rows about 10 to 12 ft. apart. The branches in a few years should shade the whole of the ground. They need practically no pruning, and most, if not all, the suckers are allowed to grow up round the tree. The figs on these are later in coming to maturity than those on the main stem.

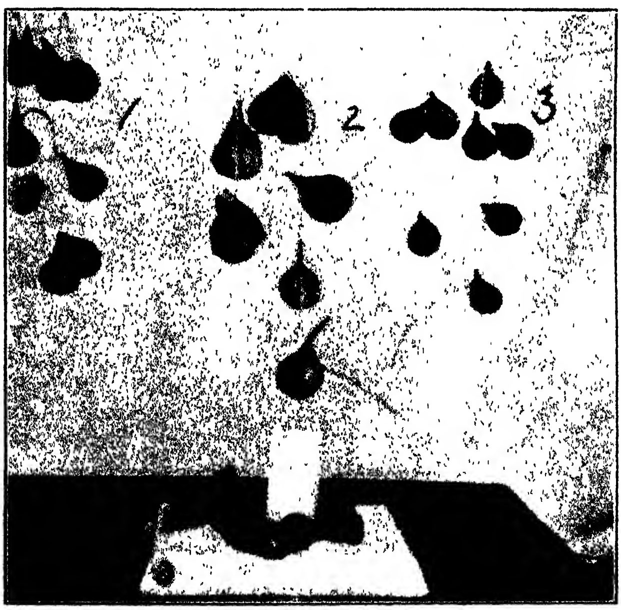
It is advisable to plant so that you can irrigate at least a few of the trees; this assures a plentiful supply of buds, and somewhat retards ripening, and so lengthens the period of emergence.

METHOD OF CAPRIFYING.

This is done by stringing a number, say five to ten Capri figs (profichi crop) on a bit of twine, raffia, rush, or some such material,



Leaves and Fruit of Capris Nos. 1, 2, and 3. Plate of figs underneath are Smyrnas at right stage for caprifying.



Capri Figs. Nos. 1, 2, 3, strung on raffia ready for placing on Smyrna trees. Figs on plate underneath are Smyrna at right stage for caprifying.

just about the time the insect begins to emerge. This period can be gauged within a day or two by cutting open a few of the figs and observing if there are a number of males busy moving about the galls. If this is so the fertilized females will very soon eat their way through the little galls and thence out through the eye of the fig; the fruit at this stage also becomes soft to the touch.

The strings of figs that have been prepared are then placed here and there among the branches of the Smyrna trees either by throwing them up in the tree or placing them where required with a long light pole such as a bamboo. In some cases for the first caprification four or five figs are placed in little wire baskets tied in different parts of the tree. For small or young trees a couple or three strings with, say, five figs on each would be sufficient for all the figs that would be likely to be fit. Very large trees will take up to fifty figs to do the first caprifying. As the Smyrna figs are not all fit to receive the insect at one time it is advisable to give the trees a fresh lot of Capris in about a week or ten days' time to pollinate the figs that were too small at the first caprifying.

When the figs come on slowly and unevenly it is sometimes necessary to caprify a third or a fourth time so that the whole of the crop may be fertilized.

The caprifying should be done from the time the Smyrnas are about the size of a hazel-nut up till they are nearly the size of a walnut, say, from a little under half an inch to one inch in diameter. The flowers inside must not have become brown, must be of a greenish colour, and be upstanding. A safe proportion of Capri trees to Smyrna trees is one Capri tree to fifty Smyrnas. Each fig may be looked upon as giving from 300 to 600 insects.

Introduction to California.

Cuttings of the Smyrna fig tree were first introduced into California in the year 1880. It was soon found that something was lacking, as these trees dropped their fruit when about half-grown, in spite of having Capris in the vicinity and their figs being introduced into the Smyrna trees.

And this missing link in the chain of success was the little wasp *Blastophaga grossorum*.

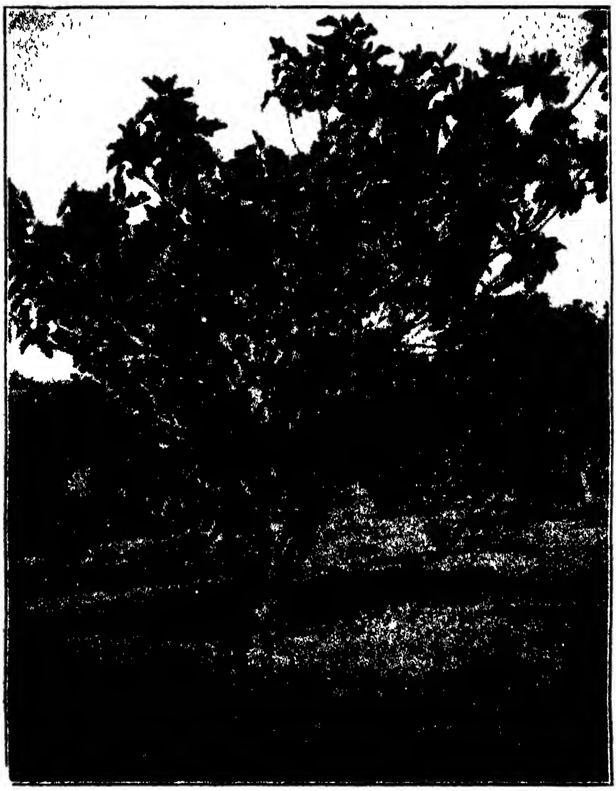
In 1890 a few Smyrnas were artificially pollinated by Mr. Geo. C. Roeding by taking pollen from the Capri and introducing it with a crow quill through the eye of the Smyrna. All the figs so treated held to the tree and matured. The same result was obtained by Dr. Eisen and Mr. E. W. Maslin in 1891. It was thus proved that pollination was absolutely necessary for this type of fig, and the conclusion was arrived at that this should be the work of some insect, and that that insect must be the *Blastophaga*. The details of the attempts made to introduce this little insect may be said to be one of the most romantic incidents of modern horticulture, and would take rather too long to recount.

Efforts were first made in 1891 to introduce the insect to California, and after six futile attempts being made and lots of money spent by private individuals, companies, and the agricultural department.

After eight years of persistent and continuous effort the seventh and last introduction from Algiers, sent over to Mr. Geo. C. Roeding

by Mr. W. T. Swingle, of the department of agriculture, in 1899, proved successful. The insects entered a number of the young Capri figs on the trees and thus became permanently established in California.

The Smyrna trees held their crops, and the best drying fig in the world was given a place amongst the progressive fruit growers of the West to enter into competition with the decadent East, that for over twenty centuries had supplied practically all the dried figs of commerce.



Capri Fig Tree No. 1. At Elsenburg, 1912.

RENAMING THE FIG.

The Symrna of Asia Minor, soon after being firmly established in America, was given the name "Calimyrna", being a word compounded from the two words California and Smyrna, taking the first part of the first name and leaving out the "s" of the second name. This end was arrived at by giving a prize for the most euphonious and appropriate name for the fig, and "Calimyrna" was selected from among the thousands submitted.

As there are a number of varieties of Smyrna figs, this name is given to the most famous drying fig known to distinguish it from other varieties of Symrna figs.

Introduction to South Africa.

On hearing of the success in California, the Cape Department of Agriculture was not long in getting an importation of trees direct from Mr. Geo. C. Roeding, which consisted of a parcel of 140 Capri and Smyrna trees of different varieties (Calimyrna, Kassaba, Bardajie), mostly Calimyrna and Capris No. 1, No. 2, No. 3, which three varieties between them keep figs on all the year round. This was in 1902-03.

Capri Fig Tree No. 2. At Elsenburg, 1912.

Two lots went to Constantia District, one to Elsenburg, and one to Grahamstown.

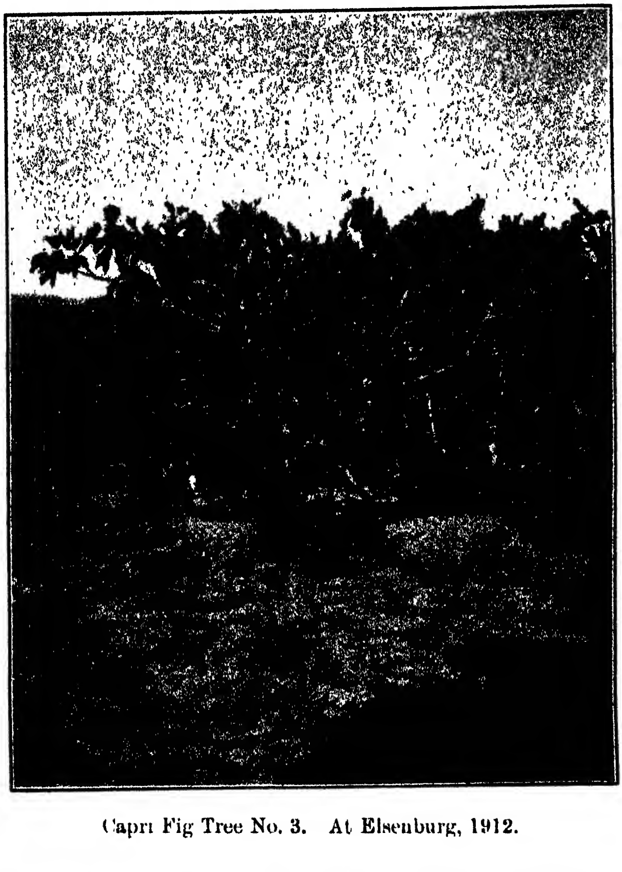
In July, 1907, Mr. Lounsbury, then Chief Government Entomologist of the Cape, but now Chief Entomologist of the Union, was in America, and as both our Capri and Calimyrna had reached the fruiting stage he arranged to have some of the *Blastophagas* sent on at the right season. In November, 1907, Mr. Mally, Assistant Government Entomologist (Cape), on his return from California, got four twigs of Capri from Mr. Roeding with fruit containing wasps. They were wrapped in damp moss and kept chilled till landing on 4th January, 1908.

One twig with figs on was put in a tin of moist sand at once and exposed to the sun and outside conditions. The others were kept in

cold store till 20th February. After thirty-five days of exposure the first twig yielded a few females. This was at once brought to Elsenburg by Mr. Lounsbury himself, who gave instructions as to what attention, etc., was to be given to the cutting and insects when they emerged. Whether any insects got into the Capris or not from this twig is not certain.

The second lot was brought out on 25th March. The insects were carefully watched and helped where possible, and figs into which they were seen to enter marked.

The experiment proved quite successful, and the Calimyrnas have been pollinated by them each year since their introduction.



Capri Fig Tree No. 3. At Elsenburg, 1912.

The following is within a few days—either earlier or later—the time at which the *Blastophagas* enter each crop of figs on the Capris at Elsenburg:—

1st Crop Profichi ...	Enter 2nd week in September Emerge 2nd week in January	4 months.
2nd Crop Mammoni ...	Enter 2nd week in January Emerge 2nd week in March	2 months.
3rd Crop Mammei ...	Enter 2nd week in March Emerge 2nd week in September	6 months.
		12 months.

ADVANTAGES OF CALIMYRNA FIGS AND CAPRIFICATION.

Apart from having the best drying fig in the country that ever the world has known, with its necessary appurtenances—Capris and *Blastophagas*—it can safely be assumed that by the caprification of some of the old established figs of the country that bring to perfection only one of their crops, such as figs of the San Pedro type that only mature Brebas or first crop, a considerable gain will be obtained through having the insect and the pollen from the Capri (male fig) to pollinate the second crop of these varieties, which is now lost to us.

It has already been definitely established that the Castle Kennedy, which only matures its first crop under ordinary circumstances, will with caprification mature its second crop, and so with many other varieties.

If the Capris of the district do not always fit in for pollinating these first or second crops that are now lost, they may be obtained from either late or early districts for the purpose of pollinating the crops as occasion may dictate. This will materially increase the returns of our already existing fig industry.

The superiority of the Calimyrna over other drying figs shows itself in the properties of superiority of taste and nuttiness of flavour that it has on account of maturing seeds and becoming botanically ripe, on account of its falling off the tree when it has reached a state of maturity, and on account of the lesser amount of manipulation required to make a perfect dried fig.

Sulphuring, and even the dipping and processing as in other figs, is not absolutely necessary. The colour, smoothness, velvetyness of skin, etc., is all that can be desired.

The fig is one of those trees that thrives over as big an area, in as many kinds of soils, and under as variable climatic conditions, as any other of our fruit trees. and there are many places in the Union where it should grow to perfection, especially if from one to three waterings could be given per year. Where the soil and conditions are suitable, I don't think one could put their land to better use than to laying down a Calimyrna fig orchard, say, from five to ten acres to start with.

The Preparation of Wool for the Market.*

By C. Mallinson, Principal Flockmaster of the Union.

Wool production and the profitable rearing of sheep are industries so intimately connected with the commercial welfare of South Africa that it is incumbent upon every one having experience in the trade to further in every way in their power the development and improvement of the flocks in South Africa by imparting the results of such experience to those directly concerned in sheep raising. This article is written with the object of giving a word of advice and encouragement to the smaller farmers who are far in the majority in this country, and, consequently, a good deal of it will appear to some an unnecessary repetition of what is common knowledge. On the other hand it may yet be advantageous for those who are well grounded in the details of sheep farming to carefully read and digest the conclusions arrived at on matters essential to the successful conduct of wool growing.

Casual inspection of wool show-rooms on almost any sale day will readily convince the visitor that the quality of a large proportion of the main staple in this country is not being unjustly decried when it is described as poor to medium only. Individual effort on the part of every farmer can alone remedy this undesirable state of affairs, and it is within the power of every wool grower by steadily, if slowly, increasing the weight (this does not mean excessive yolk or foreign matter) of his fleeces and improving the general type of his flock to establish the reputation lately earned by South African wools on the world's markets. Every ounce added to the average weight of a clip and every farthing gained in the average price may be regarded almost entirely as direct profit on the year's working, so small a difference is there between the cost of tending a high class and a low class flock.

To many readers of this article it may cause surprise to learn that an extra penny per pound on the wool grown in the Transvaal alone would, taking the weight of 9,730,587 lb. produced in that Province during the twelve months ended 30th June, 1910, amount to no less than £40,544. 2s. 3d., and if to that be added a supposed gain of only one pound per head over the 2,019,614 woolled sheep of the Province at the average price of, say, 6d. per lb., there would be an additional £50,490. 2s., or a total of £91,034. 4s. 3d., to place to the credit of farmers in excess of the gross sum actually realized for the year's clip.

The following suggestions and hints are intended to enable the wool grower to make the utmost of such opportunities as may be available to him in respect to the shearing of his sheep and the preparation of the wool for market. The remarks are intended to

* This article was first published in the *South African Agricultural Journal*, September, 1911, and is now reprinted with additions.

apply to the getting up of an average South African clip of, say, up to thirty bales, in such a way as to attract the greatest attention from buyers. For this purpose it is necessary to enter into a few side issues pertaining to the subject in order to demonstrate more plainly to readers the advantages to be derived from paying proper attention to the work.

GENERAL.

First of all, then, one requires a fairly high class and uniform flock to produce good, even, and attractive wool. This can only be obtained by judicious selection, i.e. breeding only from the best stock and rejecting from the breeding ewes all inferior and faulty animals. This is one, if not the most important, factor in successful sheep-breeding. The action of rejecting inferior sheep from the general flock is known by the term of "culling". An attempt cannot be made here to enter fully into the question of culling, but a few recommendations are offered for general guidance.

In the first place, grown sheep should be classed in the wool just before shearing. Care should be taken not to cull either for frame alone or for wool alone. Adhere to the happy medium and gradually the eye and hand, working in intelligent sympathy, will tell with seldom failing accuracy by the "look" of the animal and the "grip" of its wool, whether the particular sheep has to be more carefully examined for possible rejection. Special pains should be taken in culling the breeding flock to distinguish between "wet" and "dry" ewes. It may be that a rather feeble sheep is the mother of a sturdy lamb, and therefore a better payer, all things considered, than a broad-backed, well-fleeced ewe whose udder proves that she has brought none but herself to the yard to add to the year's returns. In culling as a whole, take into account the season the sheep have just passed through. It is a common saying, but a very true one, that a good deal of breeding goes in at the mouth. Accept as a guiding principle always "the survival of the fittest". Make provision for sufficient nutritious feed for the flock both during the summer and winter months in order to develop the very best that is in them and keep up their constitution. Starvation and impure water will not only bring down the constitution of the best sheep but also affect their wool-producing properties to a remarkable extent.

It is most desirable that farmers should not breed from sheep showing black or grey hairs, that the greatest care should be taken in selecting rams from flocks as free from black hairs as possible, and that black and grey lambs should be slaughtered.

SHEARING AND PREPARATION OF WOOL FOR THE MARKET.

The operation of shearing calls for few remarks, but it is thought the following essentials could be profitably taken to heart by farmers concerned in sheep-breeding.

Shearing.

Proper accommodation should be provided in which to carry on the work of shearing. There should be ample space for every shearer to carry on the operation conveniently and to spread out the fleece as he goes along, and enough light to allow the work to be comfortably done. The floor or shearing board should preferably be of wood, but

any other hard material would do. It should be kept scrupulously clean and free from foreign matter; it should be swept after every sheep shorn and the fleece should be picked up before the shearer starts on his next sheep.

The catching pens should also be kept clean. The farmer should make it a point to keep the dust down in every possible way. The abominable practice of mustering the whole mob of sheep near the shed (or the poor substitute for a shed which is too often found on farms in this country) and filling the catching pens by catching the sheep one by one should be dispensed with. It not only does the sheep terrible harm, but also spoils the whole clip.

Sheep should, in ordinary circumstances, never be shorn until the wool is of twelve months' growth. They should be perfectly dry at the time of shearing.

When a shearer is selecting the sheep he intends to shear, it is most important that he should carry the sheep from the catching pen to the shearing floor and place it on its rump. This plan does away with that cruel method of dragging the sheep from the catching pen by the hind leg. The belly wool should then be shorn off and detached from the fleece and placed behind the shearer, so that the boy picking up the bellies can see it and put it into the basket placed on the board for that purpose.

The shearer, after removing the belly wool, should clean the sheep between the hind legs. The left leg should then be shorn as far as the britch. The next thing is to take off the fleece in one piece. The shearer should start on the right side of the neck at the point of the brisket and shear in a straight line to the right ear. The wool should not be cut but broken through with an outward movement of the arm. Second cuts should be avoided as much as possible. The shearer should shear from right to left. All cuts should be dressed with some kind of disinfectant before the sheep is released. It is desirable that the sheep should not be branded with tar or paint.

Sheep of different breeds should be shorn separately and the wool packed separately. Wool from sheep showing black or grey hairs should be kept by itself.

Picking Up and Rolling.

The fleece, after having been taken off the sheep's back should be carefully picked up by gripping the two britches, one in each hand, and gathering in the rest of the fleece by an inward sweep of each arm. By retaining hold of the two britches and throwing the rest of the fleece gently away from him, the picker-up should be able to spread it neatly, staple side up, and flesh side down on the table, without causing any break in it.

The wool-roller, who in South Africa is often the picker-up also, having the fleece before him, should first gently shake it so as to detach any second cuts or fribs. His next duty is to take off all dirty points, any inferior parts of the fleece, all foreign matter in the shape of grass seeds, burs, etc. After the fleece has been skirted, i.e. all the dirty points and locks and wool which has been stained by manure and urine have been taken off, it should be rolled in the following way: Throw over the one side so as to double the fleece, then throw in the neck, then the britch, turn in the sides and pull over the back, then start rolling from the britch up to the shoulder. This way of rolling

will expose the best part of the fleece and help the buyer to come to the correct value of the clip. This done the fleece should be passed over to the wool-classer's table. The classer will then place the wool according to quality in the different bins set apart for that purpose in any properly equipped wool shed.

Classing.

The term "wool classing" is generally applied to the work carried on at the farm during shearing time, when the wool is being prepared for the market. "Wool sorting" refers to the work done in wool warehouses and at factories where all the fleeces of an uneven quality are broken up and divided into the different qualities.

The object of classing is to get up the wool in such a way as to make it attractive. In order to obtain the best results the classing must be done skilfully, honestly, and last, but not least, very carefully. All trouble and skill will amount to nothing if the work be not done with scrupulous cleanliness and carefulness. The wool must be classed in such a way that the requirements of the different sections of buyers, who are the representatives of the manufacturers, are met. For instance, "Combers" want a combing wool, i.e. a wool with a fair length of staple and elasticity, and sound enough to stand a reasonable amount of tension. "Carders", on the other hand, are satisfied to buy the shorter and more tender, or "clothing" wool, whilst American buyers, on account of the heavy import duty [11 cents. (5½d.) per lb.] can only afford to buy absolutely the lightest and best yielding wools, so as to pay duty on as little dirt as possible. Some buyers look for fine wool, while others must have coarser qualities to suit the factories they are buying for.

All wool is valued by the buyer on the basis of the clean weight it will produce when scoured and ready for use. Suppose the clean value is 2s. per lb. the greasy value should be in proportion to the yield as per following table:—

If yielding	55%	48%	42%	36%
the greasy value would be ...	13d.	11½d.	10d.	8½d.
add United States import duty	5½d.	5½d.	5½d.	5½d.
cost greasy pound in America...	18½d.	17d.	15½d.	14d.
cost clean pound in America ...	33¾d.	35½d.	37d.	39d.

The classer should be conversant with the requirements of the trade, and do his work honestly and carefully if the farmer is to receive the full benefit of his clip. It stands to reason that a properly got up clip will inspire buyers with confidence, which means better competition and still better prices. To attain this object too much care cannot be taken. The buyer must be able to fix the price on the wool with a minimum amount of trouble. This is impossible for him to do unless the wool is classed in such a manner that the contents of a bale are more or less uniform, of the same character, quality, and marketable value. This done, it is an easy matter for the competent woolman to make up a true estimate of a lot and to cut his prices very fine. If this work is not properly done, and the bale filled indiscriminately as to condition and quality, it is impossible for any expert,

however clever he may be, to make a reliable valuation. He can only estimate roughly what proportion of good and bad wool is in the bale, and fix a nominal price for it, in which case he naturally leaves a fair margin to be on the safe side in the event of miscalculation.

It will be quite clear to everybody, after the above explanation, why wool, even a clip of 1000 or 2000 fleeces should be systematically and carefully classed. Dealing with this matter, it is comparatively simple to class a big clip, but not so when there are only a few bales to be dealt with. In the first case the classer is justified in dividing the wool into as many classes as he considers necessary to maintain the proper standard for the different qualities, while in a clip of 1000 to 2000 fleeces discretion and sound judgment are required to make a nominal standard so as to prevent too many small lots, which, as a rule, are often neglected by the bulk of the buyers.

The wool should be separated and packed as follows:—

		To be Marked.
Fleece or	First Fleeces	Fleeces A.
	Second Fleeces	Fleeces AA.
Pieces or	First Pieces	Pieces A.
	Second Pieces	Pieces AA.
Bellies	... ...	Bellies.
Locks ...	... ...	Locks.

A Small Clip.

A small clip of, say, from 300 to 500 fleeces does not require much classing. All that is required is that all the lightest conditioned, brightest, and most attractive fleeces be placed into the top or first lot, while the second sort is constituted of all the heavier conditioned, duller and less attractive ones. Any very discoloured and inferior fleeces would be better broken up amongst the skirtings. Dealing with the skirtings or pieces, it is advisable to sort these into first and second pieces. The first pieces should consist of all the biggest and cleanest wool; the second pieces of all the dirty edges or trimmings from the firsts. It is impossible to lay down a hard and fast rule for skirting fleeces, as everything depends on the merits of the fleece spread on the table. Where there are no burs or excessive grass seeds, the skirtings should be as light as possible. It is not advisable to skirt too heavily. Much harm is sometimes done by over-skirting, that is, by taking off too much wool from a fleece.

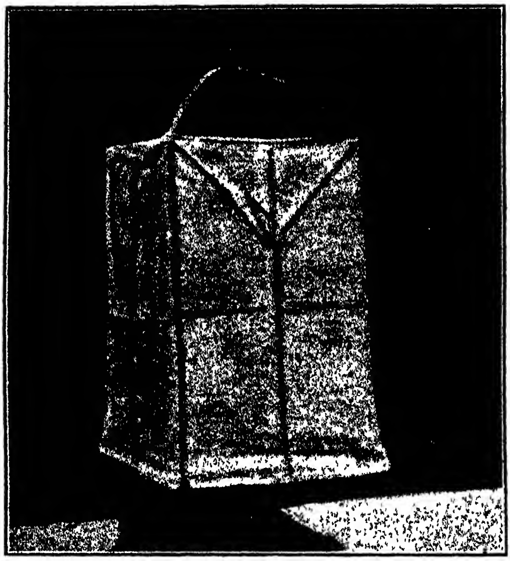
The belly-wool should also be carefully trimmed and all stained and fatty bits removed and packed separately.

Reference must again be made to black or grey hairs in the fleeces. All sheep showing black, brown, or grey hair must be shorn separately and the wool kept apart from all other. Particular care should be taken to see that the floor is *carefully* swept after shearing each such sheep so as to obviate the possibility of getting discoloured hairs on fleeces which may be subsequently shorn from white sheep.

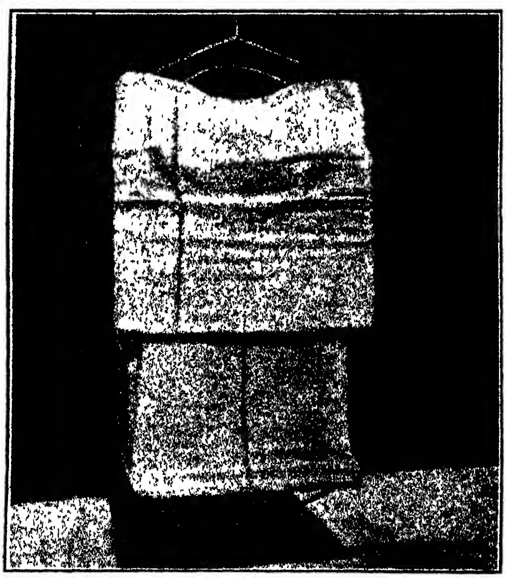
Stained Wool.

Stained wool must also be kept separate because the mixing of the good white wool with the discoloured at once reduces the value of the former to anything from 1d. to 2d. per lb. Any one with a practical knowledge of the trade will see the force of this statement,

The Preparation of Wool for the Market.



Device for suspending wool pack for singeing. The pack has been turned inside out.
(From *Pastoralists' Review.*)



Showing the wire attachment to hold top of pack for singeing.
(From *Pastoralists' Review.*)

for they know all stains have to be dyed at one stage or another, while if a fleece is white it can go straight away to be combed into a clean top. If the white wool is mixed with faulty parts it is only fit for producing a discoloured top which can be used only after it has been dyed into a dark shade, while if a top be of good colour it may be dyed into any light shade as required. The same thing applies in the case of the woollen as in the case of the worsted trade.

Locks.

Locks consist of second cuts and fribs that fall through the wool tables during the processes of wool rolling and piece sorting, as well as the locks swept from the shearing floor. There is a marked difference between table locks and the sweepings from the shearing floor. The first named are much cleaner and lighter than the latter, and if the quantity permits should be baled separately; otherwise only one line must be made. Care should be taken to run the sweepings over a fine wire screen so as to remove as much dirt and foreign matter as possible.

Wool Table.

Of course to be able to treat a clip properly, a good wool shed with proper light and rolling tables is indispensable. The way to construct a rolling table is to make a frame 4 ft. 6 in. broad × 9 ft. long of 6 × 1 in. boards, supported by legs 2 ft. 8 in. high, made from timber 4 × 3 in., and covered with 1-in. wooden battens, 1 in. apart from one another, the edges of which should be smoothed and rounded off on top so as to allow all second cuts and locks to drop through and prevent the wool being caught and the fleeces torn to pieces.

Pressing.

Every farmer should possess a wool press. Too much importance cannot be attached to the general appearance of the bales as well as the wool. The neatness and outward appearance of a bale indicates a certain amount of care and attention having been paid in this direction. Then, too, a properly pressed bale is more easily transported and occupies less space in the railway truck or ship. Where a farmer feels that his clip is too small to justify the purchase of a wool press for his sole use, it is suggested that he should co-operate with one or two of his neighbours so that they might purchase one for their joint use. The wool should be baled in new wool packs of not less than 10 lb. in weight. Before being used all wool packs should be turned inside out and all foreign matter removed; singeing is recommended to remove superfluous fibre.

Marking.

It is advisable to brand the wool bales with clear stout letters not less than $1\frac{3}{4}$ inches in height on the long side of the bale and on the bottom. On the side the following details should appear:—

The name or distinguishing mark of the grower.
The name of the farm or district where produced.
The class of the wool.
The number of the bale.

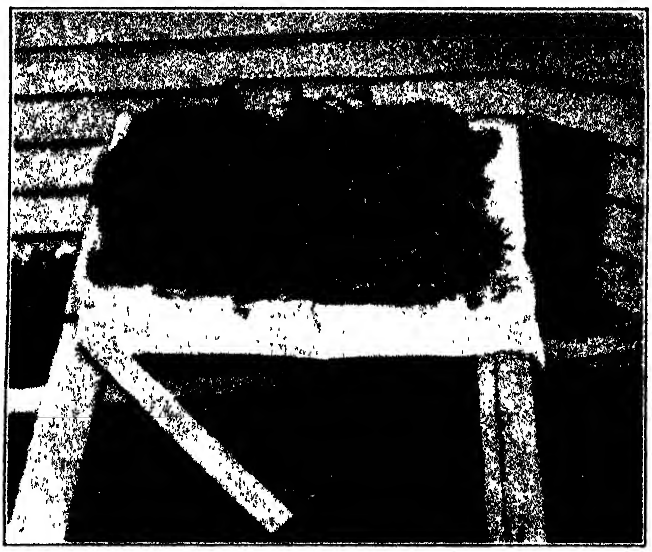
And on the end—
the owner's mark;
the name of the farm;
the number of the bales;
as follows:—
On the long side of the bale—

J. Smith.
Name of Farm.
Fleeces A (or AA, as the case may be).
1.

On the bottom—

J. S.
Name of Farm.
1.

Lambs' wool should always be marked as such and be clipped from sheep not older than seven months.



JUTE FIBRE.
Showing the rubbish that comes out of wool packs by turning them inside out preparatory to singeing them.
(From *Pastoralists' Review.*)

In conclusion it is desired to lay stress on the fact that it pays a grower, *and pays him well*, to get up a clip properly. When there is carelessness shown the value of the wool will certainly fall. No man is going to pay for carelessness.

It is obvious that a clip which at first sight appears to be smart and well got up will at once receive the full attention of a buyer. When valuing he will look carefully at the wool and not place a sporting valuation on same, whereas if a clip appears wanting and there is a mixture of bellies and pieces amongst the combing wool, it will be valued at a price that is in harmony with the allowance which

must afterwards be made for such wool, *plus* the margin above referred to, to cover any miscalculation on the part of the buyer.

There can be no deception of the buyer on this head. He knows that contingencies arise such as increased shrinkage when the heavier parts have been rolled in good combing wool.

Farmers are urged to read this article very carefully and to try to follow out the suggestions made; their recompense will lie in the improved state of their banking account.

Sheep Dipping Tanks.

THE DIMENSIONS RECOMMENDED FOR A CIRCULAR DIPPING TANK WITHOUT A CENTRAL POINT. (SEE PLAN A.)

	Feet.	Inches.
The diameter of the tank at the top (from A to B) should be	4	6
The diameter of the tank 9 inches from the surface (from C to D) should be	5	0
The diameter of the tank 12 inches from the bottom (from E to F) should be	3	6
The depth of the tank (from G to H) should be ...	5	0

The diameter at the top of the tank being 6 inches less than is the case 9 inches below the surface is to prevent an overflow of water when the sheep are placed in the tank. From the widest part (5 feet) the tank should be gradually contracted until it assumes the shape of a large soap pot. The outlet from the tank should commence at 12 inches from the bottom (point F), and should extend to point marked J, or 7 feet in length. At the top the outlet should be 22 inches wide and at the bottom 15 inches (see plan marked K). The double line marked LL indicates the place at which the sliding gate or door should be placed to prevent sheep leaving the tank until they have been immersed for the required time.

The tank should be built partly in the catching kraal, which will allow of sheep being placed in the water by several men at the same time and also prevent one animal being thrown in on top of another.

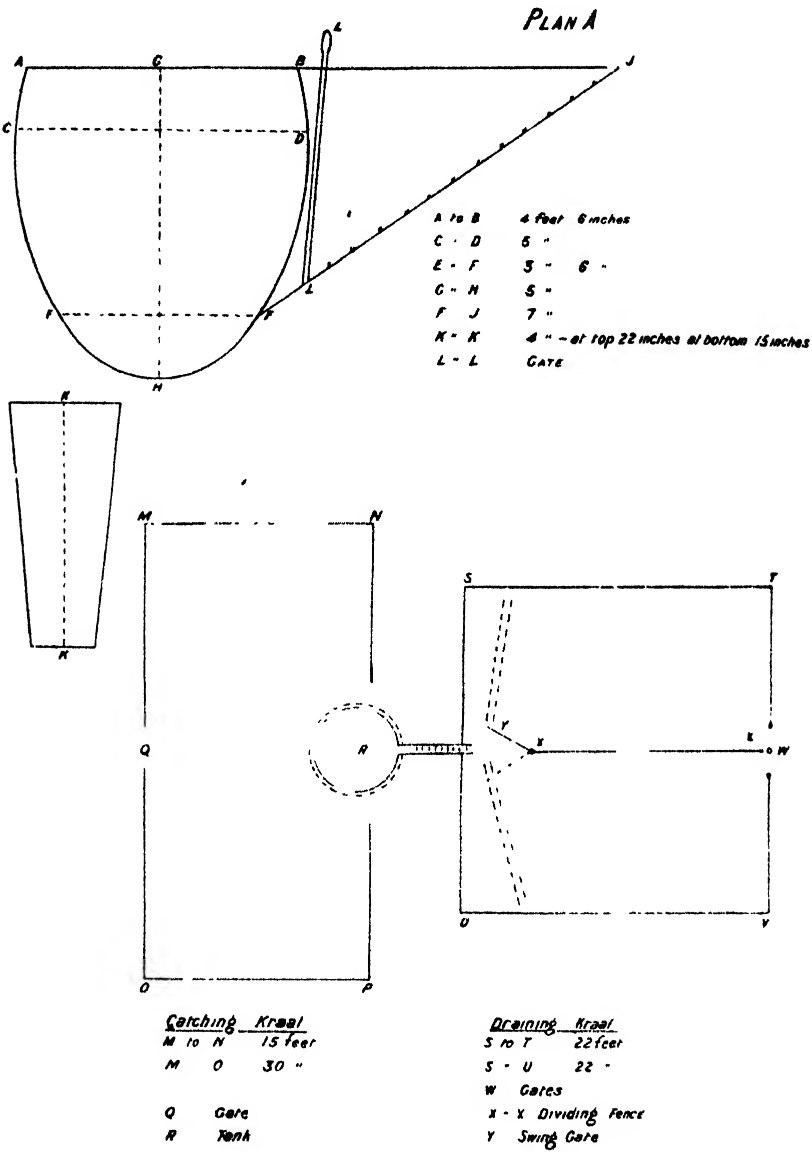
This tank, when filled to the dipping mark, will hold about 450 gallons of water, and allow of six or seven sheep swimming at the same time. The size of the tank can be increased to suit requirements, but if built according to the above dimensions should be suitable for the farmer grazing from two to three thousand sheep.

In a circular tank, built without a central pillar, there is no danger of one animal climbing on top of another, as is the case in a long, narrow tank, for each sheep must swim round the tank all the time it is kept in the water. The action of swimming opens the fleece and allows the dipping mixture to penetrate to the skin.

One man with a forked stick has complete control over all the sheep in the water, and the labour involved is much less than is the case with the long, narrow tank, in which the animals have to be continually turned over to one end of the tank. The circular tank is much more economical, for, with proper care, less water is wasted when the dipping is completed and a small number of sheep can be dipped at less cost than in a long, narrow tank.

The outlet from the tank should be built with short steps or provided with grooves to enable the sheep to obtain a footing when leaving the tank.

Flat stones should be built round the surface of the tank, slightly above the level of the catching kraal, to prevent dust and filth being dragged into the tank.



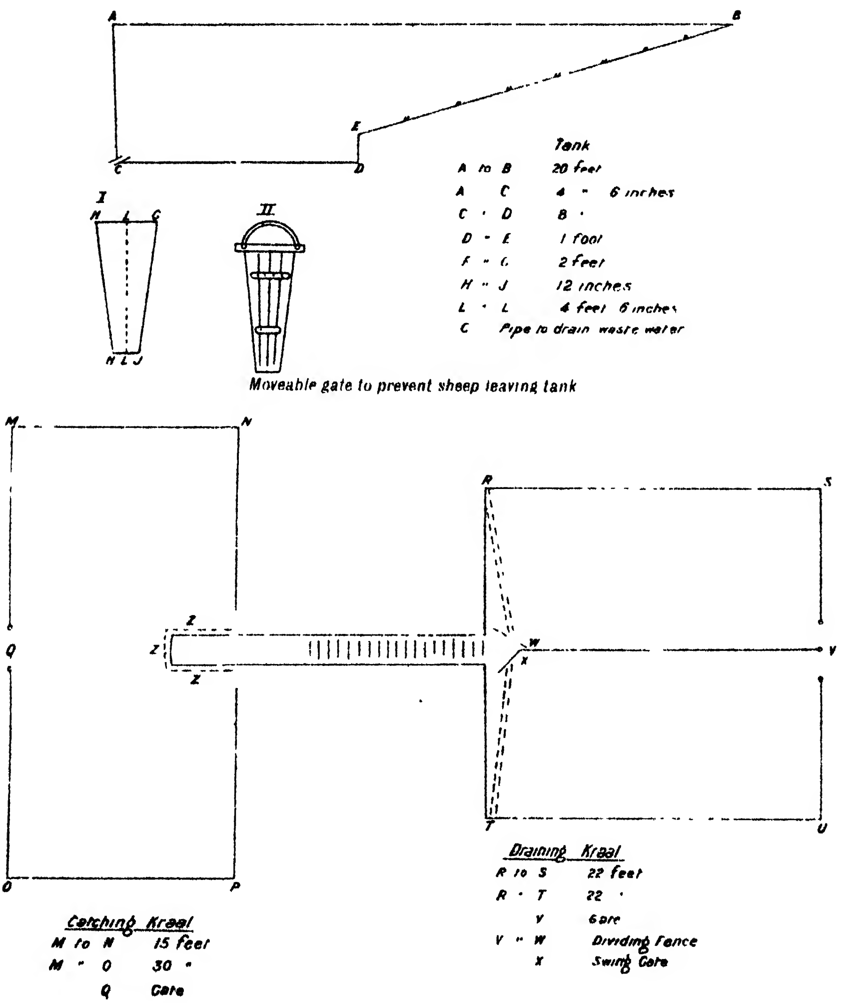
The draining kraal should be paved with flat stones pointed with cement, and with a slope to the centre of the kraal and the outlet from the tank.

Both catching and draining kraals should be surrounded with stone walls or enclosed with galvanized iron, the fences being at least 4 feet 6 inches in height.

THE DIMENSIONS RECOMMENDED FOR A LONG, NARROW DIPPING TANK. (SEE PLAN B.)

	Feet.	Inches.
Length of tank at top (from A to B) ...	20	0
Depth of tank (from A to C)	4	6
Length of well (from C to D)	8	0
Depth of well (from D to E)	1	0
Width of tank (top). (See plan I.) ...	2	0
Width of tank (bottom)	1	0

PLAN B



At point marked C (bottom of tank) a pipe should be inserted to drain away waste water from the tank.

The outlet from the tank (from B to E) should be built with short steps or grooves, which will enable the sheep leaving the tank to secure a foothold.

About 8 feet of the tank should be erected in the catching kraal, and flat stones (marked Z Z Z, slightly above the level of the kraal) built on the top to prevent dust and filth being swept into the water.

The draining kraal should be paved with flat stones pointed with cement, with a gentle slope to the centre of the kraal and the outlet from the tank.

The catching, as well as the draining kraals, should be surrounded with stone walls, or with a fence made of galvanized iron, at least 4 feet 6 inches in height.

A moveable gate or door should be provided, which can be placed at any part of the outlet to prevent sheep leaving the tank before they have been thoroughly immersed. (See plan II.)

A tank of the above dimensions can be enlarged to meet requirements, but if constructed according to the dimensions recommended should be of sufficient size for the farmer owning from two to three thousand sheep.

Protection Against Malaria.

THE SELATI RAILWAY CAMPAIGN.

Those living in fever areas will be interested to learn something of the results of the anti-malarial campaign which has been waged since 1910 at the Selati Railway Construction Depot at Newington in the northern Transvaal. Newington, it may be remarked, is situated in the Lydenburg District, seventy-four miles north-north-west of Komatipoort, and has a dry, sub-tropical climate, with a rainfall that does not appear to be excessive and occurring as summer downfalls only. The campaign against malarial fever was a systematically conducted one under the direction of the Medical Officer for the Selati Railway Construction, Dr. J. Stanley Avery, who narrates his experiences in the November number of the *Transvaal Medical Journal*. The various precautionary measures which were adopted with a view to limiting the spread of the disease in and around Newington were as follows. They are named in the order of their relative importance as applicable to that particular locality, not necessarily in the order in which they were taken.

(1) Drainage and filling-in operations;
(2) clearing of bush and burning of veld and rubbish;
(3) segregation;
(4) mechanical protection of individuals and of receptacles intended for the purpose of storing water; and
(5) quinine prophylaxis.

None of these methods was found feasible in its entirety, but all were found to be practicable within certain limits. Had it been found possible to carry out the first of these to its entirety, it would not, of course, have been necessary to have recourse to the other measures. The reduction of the anopheline mosquito is essentially the radical measure which tends to remove the spread of the disease.

Dr. Avery and his assistants dealt radically with all breeding-pools on the north-eastern slopes of the ridge on which the European quarters are established, and which were found to exist within a radius of 500 yards from the summit of the crest; whilst in the opposite direction, where the fall tends to be greater, all collections of water capable of harbouring the larvae of anopheline were similarly dealt with for a distance of at least 900 yards from the main line of railway as it traverses the depot from north to south. Some were filled in, others drained, and all rendered uninhabitable alike for harmless and malignant species. The vleis, to which the rain-water gravitated from the camp, were drained and cleared, so that the water passes through to be distributed and finally absorbed at a relatively safe distance. The total number of pools and hollows

dealt with was nineteen, with three large borrow pits and one open well. Of these, nineteen were emptied, including the pits, and three filled in along with the well. Dr. Avery calculates that about 2000 linear yards of drain had to be constructed in order to link up these pools and to conduct the water to a safe distance.

As regards the second of the precautionary measures enumerated above, the whole of the veld, standing seven and eight feet high in places, was burnt off during the winter months, commencing towards the latter end of May, in the hope that many of the adult hibernating insects would be destroyed or driven out. In this connection Dr. Avery quotes a statement by Ronald Ross to the effect that "during the daytime the adults took refuge in the grass from which it was necessary to expel them"; this fact was noted when, in 1908, the author was attempting to measure the output of mosquitoes from a known area of marsh in the vicinity of Clairfond, Mauritius. Dr. Avery says: "The burning of the veld is discouraged by the Government authorities (1) because it retards the growth of trees by stunting and distorting them, and (2) because less moisture is retained and more is lost by gravitation towards the vleis. When the grass stands high and is allowed to wither there is less tendency for the soil to be washed away by the heavy tropical showers which descend at intervals through the late spring, summer, and early autumn months, but burning has one great practical advantage that it enables one to locate the smaller breeding-pools which occur principally in the vleis and which otherwise might easily be overlooked." The bush was thinned out on the summit of the rise and a space measuring 75 by 100 yards was cleared around the house to permit of freer ventilation. No attempt was made to deal with holes in trees, etc., as they were not observed to hold water, nor was it found feasible in the limited time at Dr. Avery's disposal and in view of the large amount of work which had to be undertaken, drainage principally, to clear the bush thoroughly to a distance of at least 500 yards around the camp, as Dr. Gordon, Messina, northern Transvaal, has suggested.

Empty bottles and tins were not permitted to accumulate in and around the dwelling-houses and store. They were collected in sacks by the sanitary gang and disposed of principally by burial.

As regards segregation, a distance of some 500 yards was fixed between the European and native settlements. Major Ronald Ross, Dr. Avery says, looks upon segregation as a most important measure for preserving the health of European officials, not only against malaria, but against many other diseases.

Another precautionary measure taken was the mechanical protection of dwelling-houses, etc. The headquarters of the South African Railways officials, the post office, and station master's coach, the men's quarters, and those occupied by the manager of the Selati Railway Provisions Department, with the accountant of that particular branch, were all rendered proof against the entry of mosquitoes, whilst the firm's offices and the medical quarters, together with the hospital, were all similarly dealt with on approved lines. The windows were provided with closely fitting gauze frames, and the doors fitted with mosquito-proof gauze panels, whilst the verandahs were likewise netted in. The hospital is raised on wooden stakes four feet above the ground, and is approached from the front by steps

leading on to the verandah. The latter, which is six feet in width, runs round three sides of the building, and has been rendered absolutely mosquito-proof by filling in all the spaces left between the ends of the flooring boards and the corrugated iron side walls of the building with strips of wood. Similarly the recesses underneath the sheets of iron forming the roof of the verandah have been effectually closed against the entry of mosquitoes from without by filling in over the purlin with a mixture of cotton waste and white lead, though Dr. Avery believes that tow soaked in linseed oil does equally well.

The sixty-four 600-gallon water tanks have been rendered absolutely insect proof also.

Quinine has, of course, been used extensively. The drug has been distributed gratuitously to meet the requirements of each individual employed on railway construction work, but few have been induced to take the drug throughout in a systematic manner. Quoting his own individual case, Dr. Avery says that, for the first six weeks of his sojourn at Newington, he took ten grains of quinine a day in divided doses morning and evening; subsequently fifteen grains on two days in the week, namely, Sundays and Wednesdays, whilst latterly he has been taking five grains a day before breakfast as a rule. This treatment, together with mechanical protection when camping out and the benefits accruing from an efficient drainage of the locality, has resulted in the enjoyment by Dr. Avery of not relative but absolute immunity from contagion.

Dr. Avery thus briefly summarizes the results of the anti-malarial campaign: "There has not been a single case of primary infection and only one of reinfection in Newington itself during the whole of the fever season, which is now practically at an end: in other words the victory has been as complete as any victory is ever likely to be."

Notes.

Purchasing Stud Stock.

The Secretary of the South African Stud-Book Association, Capetown, draws attention to the necessity on the part of prospective purchasers, when buying cattle stated to be entered in the stud book, of making sure that such animals are either entered or are eligible for entry, especially in view of the fact that there are what might be termed "probationary sections" for the entry of animals not fully qualified for entry in the stud-book proper. In case of any doubt, the Secretaries of the Stud-breeders' Associations in the Cape, the Transvaal, and the Orange Free State will be happy to furnish any information.

Black and Grey Hairs in Wool.

The following circular has been issued by the Bradford Chamber of Commerce, under date 18th November, 1911:—Numerous complaints having been made to this Chamber of the increasing prevalence of black and grey hairs in all classes of wool, a joint meeting of the Wool Merchants', Spinners', and Manufacturers' sections was convened for the purpose of finding out whether this difficulty was confined to individuals or was general throughout the trade. A very largely attended meeting was the result, and every speaker on the subject had the same complaint to make, viz., that black and grey hairs were prevalent more or less in every type of wool, both Colonial and English. The Continental manufacturers have also strongly expressed their feelings to the same effect. It was pointed out by many speakers that these black and grey hairs are found in the staple, and are chiefly due to the practice of breeding from the Shropshire and Down types of sheep, due no doubt to the desire to improve the quality of the carcass; whilst some speakers pointed out that in many districts the presence of a black lamb or black sheep in the flock was considered to be lucky.

These black hairs are comparatively few in number, and are so spread amongst the white ones as to render it impossible to take them out by sorting, and are therefore most deleterious for all but the cheapest or darkest kinds of cloth. As the trade in pure white goods has been developed to an enormous extent, and is one of the most important branches in the industry, the wool trade section of the Chamber strongly desire to impress upon all growers the importance of exercising such action as they may deem expedient to remedy these difficulties, and recommend: (1) That farmers should not breed from black or grey sheep; (2) that the greatest care should be taken in selecting rams from flocks as free from black hairs as possible; (3) that black and grey lambs be slaughtered. It is sincerely hoped that the prominence which is now being given will

have the desired effect, including amongst others that of, where possible, selecting the breeding stock from such sheep as show the least tendency in this direction.

Bacon Curing in Rhodesia.

Much attention has recently been directed to the development of bacon curing and animal industries in Rhodesia, and the British South Africa Company has lost no time in meeting the wishes of the farmers of the country that the industry of bacon curing should be started at once. As a consequence it has been decided to construct a bacon factory with a capacity of about 500 pigs per week at Bulawayo. The specifications and plans are being prepared by Mr. Loudon M. Douglas, F.R.S.E., Technical Adviser to the British South Africa Company, and particulars of these may be obtained on application to the Commercial Agent, Bulawayo, Rhodesia. Other bacon factories are likely to follow. It will be remembered that Mr. Loudon M. Douglas carried out a most successful propaganda in Rhodesia during last year in connection with swine husbandry and the establishment of animal industries, and he will continue the good work thus begun during the present year and will make Bulawayo his headquarters.

Wheat: Seed Selection.

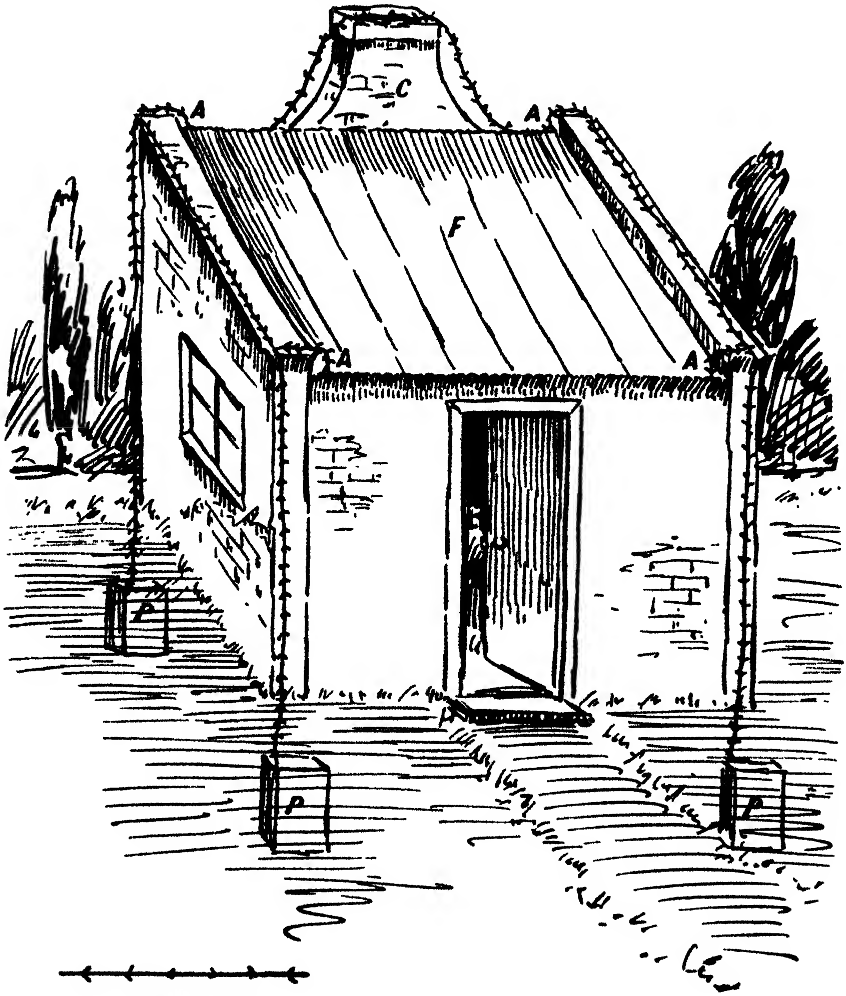
Mr. J. H. Nolte, of Rhenosterfontein, P.O. Rieckertsdam, Marico District, Transvaal, recently forwarded to the Government Botanist a sample of what may eventually become a new variety of wheat, and in the course of a letter to Mr. Burtt-Davy he thus explains its origin: For about three years previously they had very bad seasons with rust which destroyed their crops. They noticed some ears, however, which were very good and had not been touched by the rust at all. These ears Mr. Nolte picked, gathering about 5 lb. This seed he sowed the next season with several other sorts, and the only difference he discovered was that it was a good deal earlier than all the other sorts sown at the same time. It is the third season now that Mr. Nolte has propagated his new wheat with success.

Protection against Lightning.

"Weerzame Burger", P.O. Makemskuil, referring to the article by Mr. Innes in the November issue, on the above subject, propounds a question which is of interest to a considerable number of farmers in various parts of the country. In correspondent's district there are many houses built in the form illustrated in the accompanying sketch, and the problem is how such a house, with its walls projecting above the level of the roof, can be protected. Evidently the plan of connecting up the iron roof with the rain-water pipes which answers for ordinary houses will not do on account of the peculiar walls.

The inquiry was referred to Mr. Innes, who kindly furnishes the following memorandum in reply: "I think that 'Weerzame Burger' has been able to follow and appreciate the bearing of the hints already given on protection against lightning, and he sees that the

method of house construction which he describes leaves the house partially unprotected. This difficulty, however, is not a serious one; the point to be borne in mind is that every projection above or beyond the iron roof should be covered with wire (barbed galvanized iron wire is the best), which is joined on to the iron roof. The iron



Barbed wire.

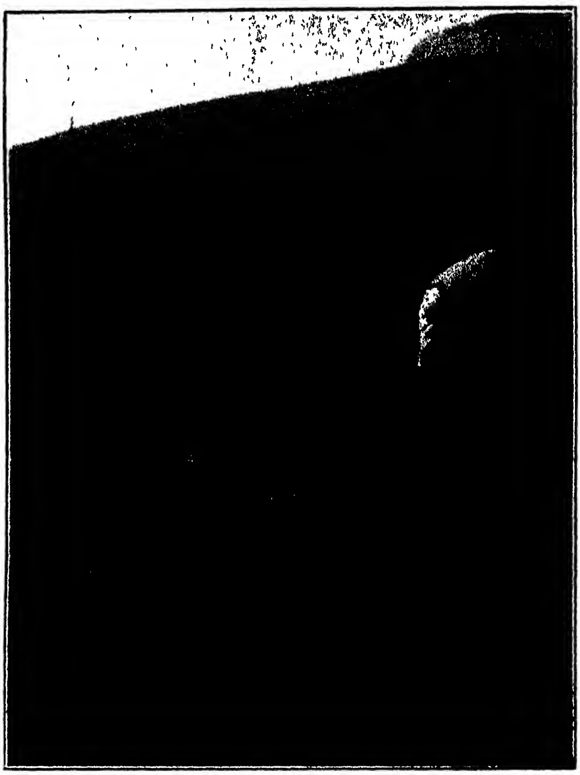
A. Four corners where the barbed wire is soldered to the iron roof.
C. Chimney with barbed wire fixed over it and to the iron roof
F. Flat iron roof.
P. Paraffin tins about one foot below ground.

roof, by means of drain-pipes or by wires at each corner, should be connected with the ground, and where the wires enter the ground it is well to join them on to empty paraffin tins, which will retain moisture and so form a good 'earth'. The accompanying sketch shows how a plain building may be rendered practically impervious to lightning. Finally, this opportunity may be taken to state that

for lightning conductors, iron is actually more efficient than copper and is much cheaper, and that the convenient and economical form of galvanized iron wire cannot be excelled."

Phalaris Bulbosa.

Mr. C. Ballot, of Outeniqua, George, Cape Province, forwards the accompanying illustration of a patch of *Phalaris bulbosa* in flower. About a year ago Mr. Ballot obtained some seed which he sowed in drills and kept clean. It soon began to stool freely. Towards the end of July last he transplanted these roots, planting single shoots



two feet apart each way. The only fertilizer applied was lime. At first the plants began to stool, the shoot stems extending along the ground, until about the middle of November, when the plants shot up to about six feet high. Mr. Ballot says: "The grass in the green state is relished by both horses and cattle. It also appears to make a good, sweet, palatable, though somewhat coarse hay. The stools arising from single shoots after five and a half months' growth, average about sixty stems now (29th December), some having over a hundred."

Pine Culture in the Western Province, Cape.

In reply to a correspondent at Constantia, Cape Province, who asked for advice in connection with the growing of pines, the District Forest Officer at Tokai supplied the following useful information,

which may interest growers in the immediate neighbourhood: Cluster pine (*Pinus pinaster*) is the most suitable tree, as indeed it is for most of the flat ground lying at the foot of the Cape Peninsula range of mountains. The area should be cleared of all vegetation and ploughed and harrowed. In July or August, or even earlier, if water does not lie on the ground in winter, the seed should be sown. Seed is obtainable at 9d. per lb. from the Conservator of Forests, Capetown. On receipt of cash, it will be forwarded to any address, carriage or postage being paid by consignee.

The seed can be sown either broadcast or in rows. If sown broadcast, about 22 lb. per acre is likely to give a good even full crop. Where the soil is good a little less, and where the soil is particularly bad a little more, than 22 lb. can be sown. The ground should not be harrowed again after sowing, as there is danger of the seed being buried too deep. The first rains after sowing will sufficiently press the seed into the ground to bring about a good germination. For sowing in rows, 12 lb. per acre will suffice and the rows should be three or four feet apart. On the whole, broadcast sowing gives the best results, especially in parts like the Cape Flats, where, as a rule, the natural vegetation is sparse, and does not threaten to suffocate the young trees. The advantages of sowing in rows are that less seed may be used, and it is easy to remove the weeds after the seed has germinated or to cultivate between the rows. This after-culture is, however, an extra expense, and is scarcely necessary on the Cape Flats where the natural vegetation does not quickly cover the ground again if it has been well worked.

No fertilizer is necessary, and indeed it may even be harmful, as the small trees are liable to be forced too much at the initial stages. It is better that the trees should not grow too rapidly in the first year or two, in order that a deep and firm root system may first be established, so that the plant may become independent of the frequent changes of moisture and temperature which occur near the surface of the ground. After six or seven years, when the trees will be about twelve feet high and about an inch or two in diameter, it will probably be necessary to thin out the trees. The thinning is so done that the remaining trees stand a couple of feet apart. At the same time, the lower dead branches can be pruned off. In the course of another five to eight years a second thinning may become necessary, when the trees which are left will stand five or seven feet apart, or possibly more, according to the size of the crowns of the trees. The object of the thinning is to give the crowns of the trees ample light for their development, but not to let in so much light as would produce a growth of weeds on the floor of the forest or cause the growth of lateral branches on the stems of the trees. The material from these thinnings can be sold for fencing droppers, the proceeds of which more than covers the cost of the thinning. The reasons for the need of having the trees so dense at the outset were to draw the trees up straight, to prevent the growth of lateral branches, and to keep the ground moist, cool, and free of weeds.

A tree which may be grown profitably in most parts of the Cape Flats is the golden wattle (*Acacia pycnantha*). It yields a very good

tannin bark and excellent fuel. A crop could be reaped every seven or eight years, with a possible small intermediate return from the thinnings. This wattle should be sown at the rate of six pounds per acre in rows six feet apart. For the first two or three years the ground must be cultivated as for an agricultural crop. An acre might yield some five or six tons of bark, which is valued at £5 to £8 per ton.

Pernicious Scale Notes.

THE inspection to determine the prevalence of the pernicious scale still continues (2nd February). A field staff, varying from twenty-two to twenty-five men, has been steadily at the work since stamping-out measures were suspended in the latter part of October. The whole of Pretoria, and all its suburbs, with the exception of a few relatively unimportant distant ones, has been examined property by property, and the majority of the premises at a distance thought likely to have become infested through plants known to have been sold from the Pretoria nursery where the scale occurred, have been inspected. Not many promising clues now remain to be followed up. On the whole, it does not now seem probable that the number of infested premises will prove to be greater than was considered likely in August last, but local dissemination from many centres during the present season has been extensive. The climatic conditions of the high and middle veld of the Transvaal appear to be decidedly favourable to the insect, and the conditions of the present season to be specially suitable.

PRETORIA CENTRES OF INFESTATION.

By far the most extensive outbreak in or around Pretoria is the supposedly original one, which had the infested nursery as its centre. This one involves a large number of infested trees and hedges on sixty-two residential premises, in addition to the numerous small gardens of a mission station and "location". The area was found little if any larger than was at first supposed. The remaining occurrences in and about Pretoria were as follows when the inspection of the respective sections was made:—

Pretoria (proper)	4	centres with	36	infested trees	on	8	premises
Pretoria West...	4	,,	144	,,	,,	12	,,
Arcadia	10	,,	311	,,	,,	21	,,
Sunnyside	5	,,	21	,,	,,	5	,,
Hatfield	7	,,	52	,,	,,	10	,,
Hillcrest	2	,,	15	,,	,,	2	,,
Brooklyn	10	,,	52	,,	,,	11	,,
Muckleneuk	2	,,	14	,,	,,	3	,,
Claremont	1	,,	16	,,	,,	1	,,
Daspoort	5	,,	139	,,	,,	5	,,
Daspoort Estate	1	,,	40	,,	,,	3	,,
Pretoria Gardens... ...	1	,,	15	,,	,,	2	,,
Mountain View	1	,,	39	,,	,,	3	,,
Parktown	2	,,	14	,,	,,	3	,,
Les Marais	2	,,	219	,,	,,	5	,,
Wonderboom South ...	1	,,	66	,,	,,	2	,,
Gezina	1	,,	39	,,	,,	5	,,
Rietfontein	7	,,	140	,,	,,	23	,,
Riveria	2	,,	9	,,	,,	2	,,
East Lynne	1	,,	77	,,	,,	2	,,

The number of infested trees on three of the premises found to be infested at Rietfontein has not yet been determined, but on the basis of the figures given there are, aside from the large parent occurrence, 69 known centres of infestation in and around Pretoria, comprising 1458 infested trees on 127 properties. Owing to the spread of the pest in the present season, it is not improbable that an inspection now would reveal fully double as many infested plants.

BAD OUTBREAK AT STANDERTON.

Next to the parent occurrence at Pretoria, by far the most serious centre of infestation is at Standerton. Practically speaking the whole town is infested, the pest having been proved to be present on upwards of seventy-five properties. The chief initial infection appears to have come on a number of trees purchased at the Pretoria nursery in 1907, but several independent centres of infestation, one or more of which may yet be found to be apparently unassociated with the Pretoria nursery, have been discovered.

OTHER TRANSVAAL CENTRES OF INFESTATION.

The other centres of infestation now known to exist in the Transvaal are as follows:—

Johannesburg.—Newclare: 22 trees infested in an isolated garden. Parktown: 1 centre with 26 trees infested on 3 premises.

Benoni: 1 centre in isolated orchard of several hundred trees.

Boksburg: 2 small centres on 2 premises (to be investigated).

Bethal: 1 small centre (to be investigated).

Scheerpoort, Pretoria District: 1 centre (to be investigated).

Cullinan: 1 small centre (more suspected).

Rayton: 2 infested trees in a large orchard started in 1909.

Middelburg: 1 isolated centre in town, 19 trees infested.

Witbank: 4 centres with 124 infested trees on 5 premises.

Bronkhorstspruit: 3 centres with 145 infested trees on 5 premises.

Nylstroom: 5 centres with 69 infested trees on 7 premises.

With the exception of the one at Rayton, all these occurrences are traceable to the nursery at Pretoria. Many suspected plants went to Pietersburg, but that place appears to have escaped the pest. The infested trees and those that stood around them in the Rayton orchard have been destroyed.

NATAL OCCURRENCES.

A single occurrence at Richmond, Natal, was chronicled in the December issue of the *Journal*. The infested and suspected trees were destroyed. The infection appeared to trace to a well-known Maritzburg nursery, and in consequence the several hundred parties who had had trees from that source in the same season, 1906, or in the season that followed were requested to examine their trees and to report. About two hundred replies were received, all indicating an absence of infestation. But on inquiry into the condition of places which had received trees in 1906 from the nursery through the medium of another nursery a single outbreak was discovered. This is at Moorleigh, on the Estcourt-Winterton Branch Railway; 33 trees in two isolated gardens are now infested. The evidence that the pest was introduced with the trees in 1906 is strong, but is not yet considered conclusive. However, as the occurrence at Rayton appeared to trace to the same nursery, a minute inspection of the nursery premises has been carried

out. Five to seven inspectors spent over three weeks on the place examining the stock with such care that a man had time only for about a thousand plants a day. The work was completed a fortnight ago. The fear that the dread pest was present was realized, but the infestation was so slight that the occurrence is highly mystifying. Two small spots of infestation, comprising about fifty plants, were found in a large bed of Northern Spy apple stocks raised on the place from root cuttings. The nurseryman promptly destroyed the whole bed, valued at £300. Later a little scale was found on eleven 1911 worked Northern Spy stocks in a nearby block of 15,000 plants. These plants were surrendered to the Entomologist. No trace of the scale was found elsewhere. The source of the infestation is in dispute, but it seems probable that the pest was present in and spread from a small, narrow block of apple trees that stood in the 1910-1911 season between the two beds found infested, and there is, of course, a suspicion that it has been present on the premises at least since 1906. The nurseryman thinks, however, that it must have come several years later on a certain lot of apple scions introduced from the Transvaal. Only a careful plant to plant inspection, such as that recently carried out, could be expected to disclose so slight an infestation as that discovered; its discovery in the course of ordinary inspection, such as is the practice in South Africa and in other parts of the world where nursery inspection is carried out, would be merely a piece of good luck. There are excellent grounds for supposing that, however long the scale may have been present, there was very little of it at any one time; and the systematic fumigation of outgoing stock, practised since 1904 or longer, has certainly very considerably diminished the risk of infestation having reached customers. The fact that thousands of trees from the nursery have come under observation in the course of the inspection about Pretoria, without any reason to suppose any were infested when supplied, except in the case of one of two trees found infested at Rayton, supports these views.

OCCURRENCE IN ORANGE FREE STATE.

The only other occurrence that has so far come to light is one at Viljoens Drift, a few miles south of the Transvaal-Orange Free State border. The infestation traces to trees introduced from the Pretoria nursery. Fortunately the premises are isolated. A recent inspection showed that 74 of the 75 fruit trees on the property have the scale.

NURSERY INSPECTIONS.

A minute inspection of all the deciduous fruit tree nurseries of the Union on the careful lines followed in the case of the one found infested near Maritzburg, is proposed and is now in progress. All the principal Natal and Transvaal ones have already been examined and at the time of writing a crew is at work in the Western Province of the Cape, and when these notes are printed another crew will be in the Eastern Province. These inspections are purely precautionary, there being no special reason to suppose that the scale is in any other nursery than the two in which it has been found.

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and. while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

IRRIGATION AT WEENEN, NATAL.

To the Editor of the *Agricultural Journal.*

Sir,—Seeing that there are some hopes of large irrigation schemes being started in the Union, and as I have had a lot of experience of irrigation in Natal, may I ask you to publish the following.

Of course, in the first place, water has to be taken out by a channel or through pipes from the river. This in the old times was simple enough, as generally the farmer before selecting a site for his homestead carefully examined the streams in the vicinity to see how he could bring the water to the land to be cultivated. Water-courses were then made and a dam built; the making of this generally consisted of building together large boulders and smaller stones and plastering the water side with mud and earth, until the water rose to the required level and ran on to the lands. As a rule this class of irrigation was only wanted in the winter or early spring months. As soon as the heavy storms came the dam generally gave way and back went the water; but the dam only took a few days putting right when the water was again required. It can be easily seen that in this sort of irrigation there was very little chance of spoiling the land by using too much water or of danger from seepage; and as there was only one family in each place, the owner of the farm could turn the water back into the stream where it came from, when he wished to do so for safety's sake. The older farmers, too, were generally men who had had some experience of irrigation. How different are things in Natal to-day! Large open water-courses have been constructed, some of them a good many miles in length, and in some places they are allowed to run night and day and in wet weather also. What are the consequences? Seepage in many parts and much of the land water-logged, water under the ground at three to five feet, with the result: cold lands and poor crops. Take some of the Natal lucerne lands to-day. Instead of the crops becoming heavier as the plants become older the reverse is the case, because the tap roots have reached the underground water and rotted so that the plant has to live on the side roots, and these require a large expenditure in fertilizer. These seepages and underground water generally begin when the water is allowed to run after heavy rains when the banks are wet and easily let the water through. There are hundreds of acres of land to-day in Natal that, given a fair amount of rain, used to grow splendid crops of mealies. Now, when under irrigation they would not return five bags of mealies to the acre without manure. This is to show the state of the land. Something better than mealies should be grown on all irrigable lands. Then take the system of irrigation; it is a wonder that the land is still as good as it is. One often sees Kaffirs walking about up to their knees in the mud when irrigating, making the soil more fit for brick-making than for growing crops. But take even a very careful man irrigating, even with his furrows the right distance apart, land nicely levelled, and irrigating as carefully as possible, parts of the land will get too much water. Then just as he has finished irrigating down comes a heavy thunderstorm perhaps followed by a three days' rain. This is another set-back and the land becomes more like a marsh or vlei than cultivated land.

All settlements must have settlers and it cannot be expected that they will know much about irrigation, but will be sure to use too much water. How can these things be avoided? First, where open channels are used, if not run through concrete banks, the water should *not be allowed* to run continually. It should be kept off as much as possible and only let

down when required for irrigation. In some places the channels are allowed to run so as to supply water for household purposes. This, in my opinion, is a mistake. People living on irrigation lands should all have tanks, and the water only be allowed to run two or three times a week. I once heard a very successful farmer say, "The best is good enough for me and the best are pipes and hoses." With these there can be no over irrigation, no seepages, no waiting for rain. As soon as the wagons move one crop off the land a man with a hose starts watering the ground, and doing it as nearly as possible in a natural way. Some people say "What about the expense?" My reply is, "What about the loss of land and expense in continually having to make drains, also loss by storms coming just after irrigation, also the cost of repairs to main furrow?" I have known a water-furrow in Natal which has cost thousands of pounds in repair, and masons are still working on it to-day. There is also the loss by fertilizer being either washed away or washed into one part of the land only. Then there is the waste of water. The banks will soak up an enormous quantity in a long furrow. If I had to take up irrigated land I would rather pay double or treble water rate for land that was properly laid out with pipes. Look at the gardens in Pretoria or Greytown where these are used. They are far away better than gardens where open furrows are used. In conclusion, it is generally hard work to take out a water-furrow, but where open furrows are used even with the very best class of settlers it is almost as hard to keep them from using too much water and spoiling the land.—Yours, etc.,

JAMES PENISTON.

Weenen, 2nd January, 1912.

CURES FOR SLANGKOP POISONING.

To the EDITOR of the *Agricultural Journal.*

SIR,—It may interest you to know that I have found mustard—heaped teaspoonful doses in a bottle of water—a success in treating slangkop poisoning in sheep and goats, especially if a tablespoonful of vinegar or equivalent in acetic acid is added.

If the animal is dosed immediately signs of poisoning appear, it is an almost sure cure.

A strong decoction of chicory, one tablespoonful to half bottle of boiling water is also good.

As both these plants belong, I think, to the same family and therefore may have some medicinal property in common, may not the above indicate a direction in which to experiment in search of a scientific remedy?

I may mention that the bud head only of slangkop seems poisonous, and I am allowing my small stock to eat off the flowering heads so as to prevent a new crop being sown.—Yours, etc.,

F. S. RUNDLE.

Ghanzi District, Lake N'Gami,
Bechuanaland, 11th November.

REMEDIES FOR TULIP POISONING.

To the EDITOR of the *Agricultural Journal.*

SIR,—*Re* your letter of the 10th inst. *re* cure for the above. A native on the adjoining farm to this had two oxen very bad, caused through eating tulip. A farmer who does not live very far from here told the native (1) to mix a bottle of salt and water, add a few parings of soap, shake it up well, give a bottle each to the cattle, which is to loosen the bowels, as the tulip binds them up; (2) dig the tulip out by the roots, bruise or pound the whole plant down and boil it, pour the water off and give each ox one bottle of the liquid for a couple of days. Between the second and third day the cattle got up and started to eat, although they were at death's door. This is a positive fact, as the boy is still on the farm with those same two oxen, and I was present when the farmer gave him the remedy.

Re note on page 696 in the November issue, "It is rarely eaten by stock", when spring comes the tulip appears before the grass. The cattle are known to eat it, owing to their being without grass during the winter, and the only remedy is to keep them off it.—Yours, etc.

GEO. GUEUD.

Falconhurst, P.O. Coalbrook, Orange Free State.

[The above remedy is well known in many parts of the country, but is not considered perfectly reliable by experienced authorities.—ED., *Agricultural Journal.*]

SHEEP DIPS.

To the EDITOR of the *Agricultural Journal.*

SIR,—Amongst farmers discussions are constantly occurring concerning the enormous annual cost of scab legislation, and the waste of money caused by their being supplied with

worthless sheep dips, so I feel certain that the following suggestion will be interesting to your readers.

Let every farmer when ordering sheep dip insist upon the makers or their agents disclosing the active principles contained in their preparations, together with the exact percentage thereof.

No doubt some makers will maintain that my suggestion is impracticable, but I have been in the dip trade for many years now, and I can assure farmers that there should be no difficulty whatever in furnishing this information. Those makers who are supplying an honest article at an honest price will not object to my proposal, as it will prevent fraud. For instance, take a tobacco extract dip containing 2 per cent. nicotine, and compare it with an extract containing 9 per cent. nicotine and you will find that there is absolutely no difference in the appearance of these preparations, but the difference in *value* is enormous. A 9 per cent. extract would cure scab mixed 1 *part* to 200 *parts water*, but a 2 per cent. extract would have to be mixed 1 *part to* 40 *parts water* in order to be effective. There is also a tremendous difference in the money value of these extracts, as it naturally costs very much more to produce a 9 per cent. extract than an extract containing 2 per cent. of nicotine. As there is no supervision, makers are tempted to supply the cheaper preparation, and the result is that a great deal of the extract shipped to this country—especially from America—is absolute rubbish, some of it containing only the slightest trace of nicotine. In this way huge profits are made by foreign manufacturers at the expense of the farmers and the country generally, for scab will never be eradicated whilst such preparations are in use. If, however, the farmers were to insist upon the makers or their agents disclosing the nicotine content, then they could depend upon obtaining a reliable article, as the manufacturers would be liable for damages if their preparations were found to contain less nicotine then specified. These remarks apply also to arsenical and carbolic preparations. Refuse to buy the preparations of makers who will not disclose the above particulars. The sheep inspectors in various parts of South Africa could do a lot to help the farmers in this matter. —Yours, etc.,

RALPH LEAVER.

25 Hout Street, Capetown.

THE TICK AND ARSENICAL POISONING.

To the EDITOR of the *Agricultural Journal.*

SIR,—In referring to back numbers of the *South African Agricultural Journal,* I found in the July issue a highly interesting article on "dipping and tick destroying agents" by that eminent and distinguished authority, Lieutenant-Colonel Pitchford, Government Bacteriologist, Natal. The article in question is most opportune and should be carefully studied by all cattle farmers alike, more especially by those so closely associated with the coastal belt where the disease is raging, and that division as yet not contaminated. According to Mr. Pitchford's experiences and investigations centred in the very heart of the East Coast fever, not an atom of doubt prevails that the total extermination of the transmitting tick means the total extermination of East Coast fever and many other diseases connected with the life of the tick, with consistent and systematic dipping at close intervals of three days. This fact has been so thoroughly and satisfactorily demonstrated as to leave not a shadow of doubt of its efficacy; those who will apply themselves need have little fear of serious loss or total extermination of their cattle herds, all risks relative to East Coast fever being reduced to a minimum. It appears that arsenic is the essential ingredient, and that by short interval dipping the tick in all its life stages is secured; thus there is little opportunity of the disease spreading where systematic dipping is properly taken in hand. A double advantage has been secured in the fact that whilst continuous dipping is so highly satisfactory it has little or no malignant effect upon the cattle so dipped. Moreover, the arsenic so absorbed by the skin of the beast retains its residual effect so effectively for a given time that ticks attaching themselves after the dipping operation succumb.

The question, however, arises that since so much arsenic (which is a rank poison) is absorbed and accumulated within the system of the animal dipped; is it not possible that the flesh and milk of such animals may become poisoned to a certain and dangerous degree and thus become unfit for human consumption? I read in the synopsis of Mr. Pitchford's report (page 34 of the July issue, *Agricultural Journal*): "This accumulation of arsenic is observed to be not a mere mechanical disposition or passive soaking, but rather a vital and active process, and the observation is further borne out by the fact that any arsenic in excess of the maximum content is eliminated from the skin, the *elimination taking place through absorption by the blood vessels which are contained in its deeper layers, such excess of arsenic appearing shortly afterwards in the urine.*" From this it appears to me very patent that a certain amount of arsenical poisoning does necessarily take place, but to what extent and how far the human system is liable to suffer I do not know. Perhaps Dr. Theiler or Mr. Pitchford will bear on this subject a little and give us some information, as it is of serious moment to the consuming public and of the greatest concern to purveyors of milk, etc.,

that this interesting subject should be carefully investigated and the probable arsenical effects on the human system determined. For it would be rather an intolerable situation to try and save the live stock of the country, however desirable, at the expense of human life. I notice that Mr. Pitchford has adjusted and readjusted the different dipping preparations to obtain the maximum results with a minimum of risk, but there is nevertheless a feeling prevailing that continuous dipping in arsenical preparations is apt to seriously affect the flesh and milk of animals so dipped, and this idea was very recently vented by a gentleman writing on the subject from Natal, in which he maintained that the great mortality in children where arsenical dipping took place was due to the presence of arsenic, and since the subject has been left at that and not refuted one would necessarily believe such to be the case. It is, however, of such importance as to call for the immediate attention of the authorities, and, if needs be, further and closer investigation.

I take it for granted that Mr. Pitchford's three-day dipping preparation to fill a tank of 3200 gallons would be 32 lb. of arsenite of soda (80 per cent. arsenic), 24 lb. soft soap, 8 gallons paraffin, mixed according to instructions. Would it be possible to give an estimate of what the probable cost of dipping would amount to per month for 100 cattle, allowing same to be dipped every three days, having due regard to liquid absorbed and repletion of same to keep the dip at its ascribed strength?—Yours, etc.,

SCOTT WAKEFORD.

P.O. Springfontein, 27th January, 1912.

[Had our correspondent followed this question closely he would know that the most exhaustive investigations have failed to demonstrate the presence of injurious quantities of arsenic in either the flesh or milk of cattle dipped in arsenical dips.—EDITOR, *Agricultural Journal.*]

DRAINING "DRY LANDS".

To the EDITOR of the *Agricultural Journal.*

SIR,—I notice an article entitled "Drainage of Dry Lands" in the *Weekly Press*, published in Christchurch, New Zealand, dated 6th December, 1911.

This article, I may mention, is taken from the *Melbourne Leader*, and is interesting from the fact that the theory advanced is apparently opposed to the system of dry farming now so often advocated.

According to the article, dry land which had been drained by means of underground tiles yielded a crop of hay four (4) times in excess of similar dry land which had not been drained.

I should be glad to know if any farmers in this country have tried the draining of "dry lands" and if so with what results.

The excess in yield in the case in point seems to amply compensate for the small initial outlay for drainage, which in Australia is reckoned at £5 per acre, i.e. £2 for the tiles, and £3 for the digging of trenches and the laying of the tiles, etc.—Yours, etc.,

P.O. Box 1056, Johannesburg, 15th January. G. GRINDLEY-FERRIS.

SNAKES AND EAST COAST FEVER.

To the EDITOR of the *Agricultural Journal.*

SIR,—In conversation to-day a native chief remarked that the number of snakes, especially puff-adders, has increased to an alarming extent in the part of the district in which he resides since the death of the cattle from East Coast fever. He attributes the cause to the protection afforded by the rank grass, which is not eaten down by stock as heretofore. It might be interesting to know whether this result of the scourge has been observed in other parts.—Yours, etc.,

J. Y. GIBSON,
Magistrate, Umlazi.

18th January.

EXTERMINATION OF SPRING HARES.

To the EDITOR of the *Agricultural Journal.*

SIR,—Mr. Retief has used with good effect poisoned mealies at the rate of one dessert-spoonful of Government red poison to ¾ gallon of mealies. Fill up to one gallon with water, and allow to stand for twenty-four hours. Then scatter the mealies at the places of entrance.—Yours, etc.,

De Aar. A. DU PLESSIS.

LAVENDER CULTURE FOR SOUTH AFRICA.

To the EDITOR of the *Agricultural Journal.*

SIR,—I am convinced from my experiences in two parts of this Colony that lavender could be grown profitably at the Cape, and that the plants would be rich in essential oil.

South African grown seed has almost 100 per cent. germination, and the plants grow well and rapidly. Perhaps some Government expert or enterprising farmer could start experiments and add a new industry to the country.—Yours, etc.,

W. A. W.

Port Elizabeth, 29th December.

CASTRATION OF BULLS.

To the EDITOR of the *Agricultural Journal.*

SIR,—In the December issue of 1911 of your *Journal* there appears, under "Questions and Answers" a reply from the Veterinary Division (Transvaal), under the heading "Castration of bulls", or rather young bulls. According to my experience I do not agree at all with that answer. My bulls I do not castrate under the age of from 12 to 18 months. and even at from 3 to 6 months, however well developed they may be, I consider them too young for castration. An animal which has been castrated at this age (from 3 to 6 months) does not appear to be so strong, muscular, and bold as one castrated at from 12 to 18 months. As the occupier of a farm with a very hard soil, I can also say that a bull, castrated at such a young age, does not possess such hardy hoofs and neither perhaps such strength of bone as one which has been castrated at from 12 to 18 months. For surely a bull is stronger than an ox in that his muscles are stronger and harder, and because he possesses harder bone, hoofs, horns, etc., whereas a bull castrated at from 12 to 18 months is already a half-developed bull and consequently is more muscular and is stronger in every respect than one that has been castrated too early. A big bull when being castrated is very likely to bleed too much, but if a person were first to bind the largest veins with a clean piece of cord before performing the operation, there would be no danger.—Yours. etc.,

JAC. STEENKAMP.

Wilgenhoutdrift, via Upington, 10th January, 1912.

TREATMENT FOR GREASY HEELS.

To the EDITOR of the *Agricultural Journal.*

SIR,—In your issue for January, 1912. a correspondent asks for advice as to treatment for greasy heels. I have used the following with excellent effect in my stables :—

Wash out the part affected with a solution of Jeye's fluid or other disinfectant, and then apply a salve made up of : 3 ounces lard, 3 ounces powdered alum, 1 ounce turpentine ; and, of course, keep the stable clean and dry.—Yours, etc.,

B J. DE VILLIERS.

Hanover, Cape Province, 18th January.

[The Veterinary Division remarks that the above treatment would act all right.—EDITOR, *Agricultural Journal.*]

CURE WANTED FOR A JIBBING HORSE.

To the EDITOR of the *Agricultural Journal.*

SIR,—Can you, or any of the numerous readers of your *Journal*, inform me, how one can cure a horse of jibbing in harness.—Yours, etc.,

J. A. DALES.

Hilton Road, Natal.

[As this is a subject upon which most people hold distinct views we trust our correspondent's request will evoke sympathetic response.—EDITOR, *Agricultural Journal.*]

TULIP POISONING.

To the EDITOR of the *Agricultural Journal.*

SIR,—With reference to the above, a friend of mine (now dead), who was a speculator in slaughter oxen, and living on a farm near Grahamstown badly infested with tulip, found nothing better than a strong decoction from boiling mimosa bark, giving a bottle at a dose on first symptom, repeating if necessary.—Yours, etc.,

WM. BARNES.

Grahamstown, Cape Province.

ment ... ntial oil.

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal*. In all cases replies will be posted to correspondents so soon as same have been procured.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

PREVENTION OF LUCERNE TYLENCHUS.

J. F. Parkes, Horseshoe, Bethulie, Orange Free State, writes:—I intend soon to lay down lucerne here on the Orange River fairly largely, and it seems to me that if possible some plan should be adopted to prevent the introduction of the tylenchus pest. Is there no system of soaking all seed sown in some such poison as, say, bluestone in solution, or would you suggest fumigation?

Answer.—The Chief of the Division of Entomology replied:—No tests have been made to determine what effect fumigation with carbon bisulphide or any other seed fumigant would have on tylenchus (*Tylenchus devastatrix*), but it is highly improbable that the pest would be destroyed with any such treatment that could be applied with safety to the seed. Nor has the effect of steeping dormant worms in bluestone solutions been determined; but tests have amply demonstrated that bluestone is very injurious to the seed, and the seed swells so quickly when put in any solution that there seems no hope that any steep would be satisfactory. No proof or reliable indication that any infection is *within* the seed itself has been found although carefully sought. The infection appears to be confined to chips of stem and other foreign matter that comes with the seed. Some such matter can be floated off with water, but much remains, and unless the seed is thoroughly wetted a great deal of it will float. Altogether the best that one can do towards preventing the introduction of tylenchus is to sow only seed that is guaranteed clean by a reliable merchant and that appears to be free from foreign matter. Very few cases of tylenchus infestation appear to trace to the sowing of Provence seed, but large numbers are connected with the use of South African grown seed. Imported lucerne seed is almost invariably far more carefully cleaned than the South African product, and it follows that it is generally safer to buy high-class imported seed. But at the same time the best and safest of all seed for a South African farmer is seed grown in this country in fields which the farmer knows to be free of tylenchus, dodder, and any other communicable troubles. Many farmers can supply their needs from their own farms, and others often can purchase from farms which, by inquiry or personal inspection, they are sure are free of tylenchus and dangerous weeds.

SUITABILITY OF ZULULAND FOR COTTON.

In reply to a question by Mr. Wm. Simpson, P.O. Box 1024, Johannesburg, as to whether any other crops besides sugar—such as cotton—would be suitable for the Government farms on the Zululand coast, the Director of the Division of Agriculture in Natal, wrote:—In the past there has unfortunately been little attention paid to the rotation of crops with sugar cane, a long series of ratoon crops of the Uba variety having been sought as the general practice. The high profits derivable from the production and sale of cane to the mills has led to a monoply of all suitable arable land by the sugar cane. The disadvantages attaching to such a system must, however, ultimately receive recognition, and, indeed, on several estates the introduction of suitable restorative crops has been initiated. Cotton of the Caravonica type has given satisfactory results in several parts of Zululand, and has only failed in immediate proximity to the coast. It should do well in the Umfolosi area, which has been recently thrown open for settlement, and the previously existing difficulty found in the absence of ginning facilities has now been overcome by the establishment of a central gin in Durban. A determining factor of success would be the available supply of labour, for which the cotton would have to compete with cane. This, of course,

holds good for all alternative crops. We are urging the desirability of introducing such leguminous seeds as ground nuts and soya beans for cultivation on cane lands as restorative crops. Both do well in the conditions obtaining, and have for some years past commanded high prices on the European markets, while in the near future the local demand of recently established industries for vegetable oils, should ensure full value for local sales. The establishment of a starch factory at New Hanover to treat sweet potatoes and other starch-producing crops should afford an opportunity for profitable cultivation of this class of staples, providing that concessionary railway rates can be obtained for carriage of the roots. The Umfolosi district further offers suitable conditions for the cultivation of such tropical and sub-tropical fruits as bananas, pineapples, mangoes, etc., for which a regular market exists in Johannesburg.

TICKS CARRIED BY BIRDS.

C. Thomas, Kenegha Drift, Mount Fletcher District, Cape Province, writes:—It may be of interest to the public to know the following. A week or two ago my little children were picking up dead birds (finches) all round the place. At first, of course, we took no notice of this, but as they were finding so many we began to examine them and found on every dead bird a large blue tick, which had drawn every drop of blood from the bird. Is it not just as likely for East Coast fever ticks to be carried in the same way? And what kind of fence and guards would the Government find, if this be the case, to prevent this means of spreading of East Coast fever?

Answer.—The Chief of the Division of Entomology replied:—It is to be regretted that specimens of the ticks were not submitted. I have never taken any of the East Coast fever ticks from birds. The tick usually found on birds is the Bontepoot species (*Hyalomma aegyptium*) in its larval and nymphal stages. This species has not been associated with any specific disease in South Africa. It feeds chiefly on mammals in its adult stage of life, but in its earlier stages it is partial to birds of various kinds.

BEET GROWING FOR ALEXANDRIA.

Ben Van Niekerk, Paarde Vlei, P.O. Zuney Siding, Alexandria, Cape Province, writes:—As this is a good district for growing all kinds of cereals, and other vegetation, the soil being rich and bordering on the coast, it has struck me that to grow beet here would prove a valuable asset, if we could induce some enterprising person to start a sugar factory here or elsewhere in the district. I shall be glad to hear from you, or any of your readers views on the subject.

Answer.—The Acting Government Agriculturist replied:—The fact that the climatic conditions in the Alexandria District are more suited to the growing of sugar beets than the Free State solves only one of the difficulties, and that not the most important one. It would be well nigh impossible to guarantee the growing of an area of beets sufficient to establish a factory. It might also be mentioned that the profits of growing beet for sugar are not very large. There is an article on this subject on page 501 of the November, 1910, issue of the *Cape Agricultural Journal.*

AMERICAN BUFFALO GRASS.

W. H. Rawlinson, P.O. Box 126, Boksburg, Transvaal, asks for advice in connection with American Buffalo grass in South Africa, and whether it is possible to obtain roots or seed.

Answer.—The Government Botanist (Transvaal) replied:—American Buffalo grass (*Buchloë dactyloides*) was introduced by me a few years ago and is being successfully propagated at the Experiment Station at Skinners Court, Pretoria. We have not yet had sufficient material for distribution among farmers, though we hope to be able to send it out in the course of another year. I am not aware that this grass is being grown by any one else in South Africa. With us it does not keep green in winter.

TIME TO SOW TALL FESCUE GRASS.

H. T. Black, Rietfontein, P.O. Salt Pan, via Brandfort, Orange Free State, asks what is the best time for sowing tall fescue grass and the latest date in the season that it may be sown.

Answer.—The Government Botanist (Transvaal) replied:—Tall fescue should be sown with the steady rains which usually fall in January and February. This grass may be safely sown until the end of February, although if the rains fall as late as they did last year it can be sown as long as they continue, as frost does not hurt this grass.

CUTWORMS.

E. D. B., Berlin, Cape Province, writes :—Agriculturists, as well as horticulturists, in this locality are very much troubled with the cutworm. Is it a larval form of a beetle? If so, would it be possible to war against it in that form? What is the value of many advertised remedies for killing insect pests in the soil? If they develop a gas, is it cyanogen; if not, what?

Answer.—The Chief of the Division of Entomology replied :—An illustrated article in the Cape *Agricultural Journal* for November, 1908, dealt at length with cutworms and methods for their destruction. They are the larval or caterpillar form of certain night-flying moths. The moths have dark coloured, rather narrow fore wings and pale hind wings, and they measure about two inches across their outstretched wings. They hold their wings flat on their bodies and directed almost straight backwards when they are at rest, and by these peculiarities they may be readily distinguished from fruit sucking and many other moths which like them are attracted to lights in the evening. It has not been found practicable to contend satisfactorily against any species of cutworms by measures directed against the moths despite of their coming to lights and also to moth baits. Late autumn or early winter ploughing and clean cultivation generally have a decided preventive value for the pest, while poisonous baits for the caterpillars constitute the most successful remedy. Mr. C. W. Mally, the Cape Entomologist, made careful field tests of baits near Grahamstown, and reports on his success in the article mentioned above. He recommends a bait of freshly cut lucerne, green forage, rape, young succulent weeds, or other tender green vegetation, cut up into pieces about half an inch long and moistened with poison made by dissolving a pound of arsenite of soda and eight pounds of sugar in ten gallons of water. The bait should be broadcasted in the late afternoon or evening a few days after preparing the land for the crop, and before transplants are set out or seedling plants show themselves. The cutworms, which are deprived of their food supply by the ploughing of the land, and which are prowling about in search of food, take the poisoned vegetation in the absence of anything better and are thus destroyed. The advertised remedies referred to have not proved a success against cutworms in any case that has come to my notice. One farmer who made an extensive field test of one of the kinds for which most is claimed subsequently reported that the pest was worst where he applied the treatment. They are proprietary articles and their composition is not disclosed, but it is probable that all of them depend for their supposed virtues on the volatilization of naphthaline or substances akin thereto.

WHITE ANTS IN HOUSES

Mr. A. V. Neilson, P.O. Box 5, Bloemfontein, writes :—Could you kindly inform me of the best way of dealing with white ants that have got into a house. They have already eaten away the flooring of one room and are beginning in the others. I have laid down grass, oats, bran, etc., steeped in arsenic and also in strychnine for them, but it has not had any effect.

Answer.—The Chief, Division of Entomology, replied :—Where the termites are working in the flooring the floor should be taken up and the nest, or galleries leading into it, will be found underneath. Into these galleries arsenical fumes should be pumped by means of the Universal Ant Destroyer, the most satisfactory machine for this purpose now procurable in this country. This will not only destroy the inmates of the nest, but it lines the galleries with a coating of arsenic which will make it uninhabitable for any termites in the future. The wood which is being eaten by the termites should be replaced by new timber which has been soaked previously in an arsenical solution, or painted with an arsenical paint, or treated with some white ant preservative which can be obtained from dealers in building materials. If the termites are working in the walls part of it should be broken down so as to find a fair-sized gallery which leads into the nest, and the ant pump should then be applied. Often the entrances to the nest can be located by digging a hole just outside the wall. Or if no galleries are found by this means, the white ants can be trapped by burying a piece of deal about two feet by six inches in the neighbourhood of the place where they are working. After a short time this wood will be found to be attacked and galleries leading into the nest can thus be located. When putting up a new building the following methods of prevention will be found effective. In a badly infested ant district the house should be elevated on pieces of stone or of well burnt brick, so that the floor is over two feet from the ground, as the ants will rarely build on a stone or brick pier more than one and a half to two feet. If the supports are made of wood, the wood should be of an ant resistant kind, or have been specially treated with an ant preservative. Pieces of galvanized iron should be placed on top of the posts so that they project a few inches beyond the support, or an iron cap shaped like a mushroom should be fixed upon the post on which the joists of the floor rest. A cement floor would also be effective in preventing the ants from entering a house, but it should be well made so that no cracks occur, and it should extend beyond the base of the walls for about eight inches.

FRUIT MOTH.

Mr. E. C. Wright, P.O. Box 27, Mafeking, writes :—I am enclosing specimen of moth which has turned up here in swarms during the past week, and is simply destroying all grapes and peaches which are now ripening. They suck the juice out of the fruit, and I have counted as many as twenty on one small bunch of grapes ; it is marvellous the damage they have done in a week. Have you known of this moth destroying ferns ? I have not noticed them here before, and certainly not destroying fruit as they are doing this season.

Answer.—The Chief, Division of Entomology replied :—The specimen is too badly rubbed for one to be sure of its species, but it is probably *Ophiuza catella*, a native fruit moth troublesome year after year in the western Transvaal and which occasionally, as appears to be the case this season, is extraordinarily prevalent. There seems to be nothing more practicable that one can do to prevent the mischief than to exclude the creature by means of netting ; and a cheap cotton netting for such purposes is imported from America by a few South African dealers in agricultural supplies. The caterpillar of this particular fruit moth doubtless has native food plants, but the only food plant recorded in this Division is the castor oil plant. In the July, 1909, issue of the *Transvaal Agricultural Journal*, Mr. F. Thomsen states that three years before whole plantations of castor oil were destroyed by it. A number of other species of fruit moths occur in the country. The coastal half of Natal, and the coastal districts of the eastern part of the Cape Province are much plagued by such pests, and at times the damage done to fruit is very serious. In 1900 one species, *Ophiuza lienardi*, was wonderfully abundant, and old inhabitants said they recalled two such occurrences in the previous quarter century. There is no doubt that the caterpillars could be destroyed by spraying, but because they chiefly infest wild vegetation and are rarely observed, it follows that spraying is not a practicable remedy. The localities where fruit moths do greatest harm are in parts where high " bush " vegetation grows luxuriantly. The south-western districts of the Cape are relatively free from fruit-sucking moths, but some of the damage attributed to fruit fly by Stellenbosch and Constantia fruit growers is really due to such moths.

LEAF-EATING BEETLE.

Mr. E. de Souza, Boschhoek, Lydenburg, writes :—I send you with this post insects which have become a pest during the last few years in these parts. In millions they attack roses and peach trees (leaves), and even mealies. Can you tell me how to destroy them ?

Answer.—The Chief, Division of Entomology replied :—The insects which you sent are a kind of leaf-eating beetle, which live on a great many wild plants, and no doubt the veld vegetation form the breeding places from where they swarm over the cultivated ground, attacking all kinds of young growth. The remedy is to spray the trees and plants which suffer from their attack with a poisonous mixture made of arsenate of lead, one pound in twenty-five gallons of water. The poison sticks to the leaves for a long time once it has dried on them, and one thorough spraying should be sufficient.

South African Produce Markets.

CAPETOWN.

The Produce Department of the firm of R. Müller, Capetown, reports under date 26th January, 1912, as follows :—

Ostrich Feathers.—No London sale has taken place since reporting last. Although the tendency of the market cannot be called a strong one, the Capetown market continues to prove very satisfactory, as excellent prices are still being obtained for all and any good feathers; even for those of medium qualities, buyers are readily found. The Capetown market compares very well indeed with all the others, which is to a great extent due to the local manufacture. Fairly large parcels have changed hands in favour of the sellers, as will be noticed from the following quotations :—

	£	s.	d.		£	s.	d.
Primes	17	0	0	to	25	0	0
First	12	10	0	,,	16	0	0
Second whites	8	0	0	,,	11	0	0
Third whites	4	0	0	,,	7	10	0
Inferior and stalky whites	1	10	0	,,	3	10	0
Byocks and fancy	2	0	0	,,	8	0	0
Superior feminas	10	0	0	,,	14	0	0
First feminas	7	10	0	,,	9	10	0
Second feminas	4	0	0	,,	6	0	0
Third feminas	1	10	0	,,	3	10	0
Greys	1	10	0	,,	8	0	0
White boos	1	0	0	,,	3	0	0
Light boos	0	12	6	,,	2	0	0
Dark boos	0	3	0	,,	0	15	0
Inferior boos and tipless	0	1	0	,,	0	17	6
Spadonas	0	10	0	to	2	15	0
Long blacks	3	0	0	,,	8	0	0
Medium blacks	2	0	0	,,	3	15	0
Short blacks	0	8	0	,,	1	5	0
Long floss black	1	7	6	,,	2	10	0
Medium floss black	0	12	6	,,	1	5	0
Short floss black	0	7	6	,,	0	10	0
Long drabs	2	10	0	,,	4	0	0
Medium drabs	0	10	0	,,	1	5	0
Short drabs	0	3	0	,,	0	7	6
Long floss drabs	1	7	6	,,	2	0	0
Medium floss drabs	0	12	6	,,	0	17	6
Short floss drabs	0	5	0	,,	0	8	0
Inferior long blacks and drabs	0	15	0	,,	2	0	0
Common blacks and drabs	0	1	0	,,	0	5	0

Wool.—Although the market cannot be called strong, there is still a very sound competition in Capetown. Sound staple is finding purchasers at encouraging figures. Inferior lots, naturally, meet with less attention. It is to be regretted that some farmers do not pay sufficient attention to the sorting. It is altogether in their interest that they should be very careful not to mix good, bad, and indifferent qualities. By doing so, they are losing the confidence of the market. It is a pleasure to note that there are a good many farmers who bestow greatest care on sorting, and they deservedly derive benefit from it. The following are the current quotations :—

	d.		d.
Calvinia, long	6	to	6¾
Calvinia, short to medium	5½	,,	6
Karoo and Roggeveld, long	7	,,	8½
Karoo, heavy	6	,,	7
Malmesbury and Piquetberg Lambs	4½	to	5½
C and C	4½	,,	5
Inferior to medium	2	,,	4½

Skins.—The market remains strong, the competition is excellent, and the prices realized are highly satisfactory, as long as the skins are offered sound and free of cuts. There is every reason to believe that the Capetown market for skins will continue to be in sellers' favour. The following are to-day's quotations, viz :—

Goatskins, light	13½d. per lb.
Goatskins, heavy	10½d. per lb.
Angoras	7d. per lb.
Angoras, bastard	10d. per lb.
Long wools, Caledon	5½d. per lb.
Long wools, grassveld	5½d. per lb.
Long wools, Karoo	5d. per lb.
Short wools	3½d. per lb.
Pelts and damaged	3d. per lb.
Bastards	4½d. per lb.
Capes, large	3s. 4d. each.
Capes, medium	2s. 6d. each.
Capes, cut	1s. 6d. each.
Small and damaged	0s. 8d. each.

PORT ELIZABETH.

Messrs. John Daverin & Co. report for the month of January as under :—

Ostrich Feathers.—A moderate amount of business has been done since the holidays, although prices, as we anticipated in our last report, have been on a somewhat lower basis than November–December rates. From all appearances, however, it would seem that the bottom has now been reached, and the outlook at the moment does not appear nearly so black as it did during the latter part of last year.

Prices of common and ordinary wings remain low, but there is an improved demand for best whites and feminas, and really good primes are now fetching satisfactory prices.

The London sales opened yesterday, and cable news up to the present is to the effect that prices generally are without change.

This is satisfactory news, as it was quite expected that in view of the large quantity available, and the continued absence of demand from America, some further decline would take place. Some cables report a decline in the price of byocks (fancies), but this is more than counterbalanced by an advance on primes and spadonas, and also on some lines of tails. If the sales progress in like manner, and the closing news is as good as the news that has already come to hand, we would expect to see an improvement in our local market in the near future. Another satisfactory feature is the fact that stocks locally have been much reduced, and new arrivals at present are very limited. On the other hand, we may expect a considerable increase in the supply during the early part of the year, and if the new season's supply contains the usual proportion of common and ordinary wings, we fear we cannot expect any improvement in the prices of these descriptions. For good qualities, however, we think the prospects are brighter than they have been for some time.

The first sale held here after the holidays was an unsatisfactory one, competition being irregular and prices weak, but on the two following weeks a distinct improvement was noticeable, particularly in the case of superior qualities, and although at the time of writing we can hardly quote any general advance in prices (except in the case of occasional lines), there is a much better tone in the market, and competition is decidedly more general.

We would take this opportunity of again urging upon farmers the advisability of doing all they can to improve the quality of their pluckings, as the general trend of the market appears to be towards a continued demand for good qualities at the expense of the commoner descriptions.

The following are approximate current values of unsorted pluckings, per line :—

	Whites.		*Feminas.*	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Super pluckings	9 0 0 to	12 0 0	6 0 0 to	8 0 0
Good pluckings	6 15 0 „	8 0 0	4 15 0 „	5 15 0
Average pluckings	5 5 0 „	6 5 0	3 5 0 „	4 5 0
Poor average	4 5 0 „	5 0 0	2 5 0 „	3 0 0
Common and inferior	3 0 0 „	4 0 0	1 10 0 „	2 0 0

	Tails.		*Blacks.*		*Drabs.*	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Good to super	15 0 to	25 0	25 0 to	60 0	17 6 to	25 0
Average	7 6 „	12 6	15 0 „	17 6	10 0 „	12 6
Poor	5 0 „	7 6	10 0 „	12 6	5 0 „	7 6

	Spadonas.		*Chicks, unsorted.*
	s. d.	s. d.	s. s.
Super lots	30 0 to	50 0	1 to 5
Average lots	12 6 „	22 6	
Common	2 6 „	10 0	

Wool.—The London sales now on, opened with a decline on Cape wools of ½d. to ¾d. as compared with the closing prices of the previous sales, but as they progressed this decline has been recovered to some extent, and our advices now state that the sales are going steadily for Cape wools at prices ½d. lower than the closing rates of last sales.

Locally, a fair business has been done in super long wools, but at prices not quite so good as those paid before the end of the year. Short and inferior wools are probably lower by ½d., as compared with prices paid for this description before the holidays.

There will be a catalogue sale to-morrow when 4313 bales will be offered.

The stock of unsold wool held here is about 9000 bales. The following are current prices for :—

	d.	d.
Snowwhite extra superior	18½ to	19½
„ superior	17 „	18
„ good to superior	16 „	16½
„ inferior faulty	13 „	15
Grease, super long, well-conditioned, grassveld grown (special clips)	9 to	10
Grease, super long, grassveld grown	7½ „	8½

	d.		d.		d.		d.
Grease, super long, Karoo grown (special clips).........	7½	to	8	Basuto grease, short	5½	,,	5¾
Grease, super long, Karoo grown	6¾	,,	7½	O.F.S. grassveld grease, long and well-conditioned (special clips).....................	7	,,	7½
Grease, super long, mixed veld	6¼	,,	7¼	O.F.S. grassveld grease, long and well-conditioned............	6	,,	6¾
Grease, light, faultless, medium, grassveld grown............	6	,,	6½	O.F.S. grassveld medium grown, light, with little fault.......	5½	,,	6¼
Grease, light, faultless, medium, Karoo grown	6	,,	6½	O.F.S. grassveld short, faulty and wasty..................	4	,,	5
Grease, light, faultless, short, Karoo grown	5¼	,,	6	O.F.S. Karoo grown, long and well-conditioned............	6	,,	6¾
Light Karoo lambs	6	,,	6½	O.F.S. medium grown, light, with little fault............	5	,,	5½
Cross-bred grease	5½	,,	6½	O.F.S. short, faulty, and wasty.	4	,,	4½
Cross-bred scoured............	12½	,,	14				
Grease, coarse and coloured...	3	,,	5				
Scoured ,, ,,	3	,,	8				

Mohair.—A limited business has been done in this article during the month, partly in summer firsts at, up to 11½d.; winter at 8d. to 8½d., and winter kids at 12d. to 13d. No summer kids changed hands. The stock now held here is about 3000 bales, made up of 2400 bales fine firsts and 600 bales summer kids.

Users are showing more discrimination in making their purchases, between strong and fine firsts; and differentiate in favour of the latter, to the extent of 1d. to 1½d. per lb., and this is likely to increase against the strong hair.

Farmers should take the changed situation into their serious consideration, and endeavour to meet the requirements of the trade, by breeding towards a finer quality, and what is perhaps of equal importance "culling" freely for the butcher. This latter will serve two purposes, that of lessening the size of the clip—and at the present time, the supply is in excess of the requirements of the trade—and of raising the standard of fineness of the clip.

If farmers continue to cultivate a type of goat throwing a heavy, strong fleece, instead of a fine, light, bright one, the result will be to accentuate the downward tendency of the value of Cape firsts.

The prospect of an active demand and improved prices for the coming season's clip are not bright. The following are nominal prices for :—

	d.		d.		d.		d.
Super kids..................	20	to	21	Mixed O.F.S. hair, very mixed.	7	to	9
Ordinary kids and stained.....	15	,,	18	Seconds and grey............	5	,,	7½
Superior firsts, special clips....	11	,,	11¾	Locks......................	4¾	,,	5
Ordinary firsts...............	10½	,,	11	Winter kids, special clips.....	13½	,,	14
Short firsts and stained.......	9½	,,	10	,, good ordinary....	11	,,	12
Superfine long blue O.F.S. hair.	12	,,	12½	Winter hair, short to full-grown	8	,,	8½
Mixed O.F.S. hair (average) ..	10	to	11	Basuto hair..................	10¼	,,	10½

Skins.—Sheepskins sold this week at 5½d. per lb.; damaged, 4½d. per lb.; pelts, 3¼d. per lb.; damaged, 2½d. per lb. Hair capes, 2s. 10d.; sundried, 1s. 9d. each; cut, 1s. each; damaged, 7d. each. Coarse wools, 4¾d. per lb. Goat, 13¾d. per lb.; heavy, 10¾d. per lb.; sundried, 11¾d. per lb.; damaged, 7d. per lb. Bastards, 11d. per lb.; damaged, 4½d. per lb. Angora, 8⅝d. per lb.; sundried and heavy, 7⅝d.; shorn, 6½d. per lb; damaged, 3½d. per lb. Springbok, 9d. each. Johannesburg sheep, 4¼d.; damaged sheep, 3¼d; pelts, 2¼d.; goat, 10¼d.; damaged, 5¼d.; angora, 6¾d.; damaged, 2¼d. per lb.

Hides.—Sundried 9½d.; damaged, 8½d.; salted, 8½d.; damaged, 7½d.

Horns.—3½d. each all round.

EAST LONDON.

Messrs. Malcomess & Co. report for the month ending 31st January :—

Wool.—The chief feature of the *wool market* during the month under review was the eagerly awaited opening of the first series of London Colonial Wool Sales, which commenced on the 16th inst. The offerings were not limited, but only totalled about 140,000 bales of which approximately 10,000 were South Africans.

Antwerp—generally the barometer of London—had already given a forecast of what might be expected, and contrary to expectation had shown a decline of par to 5 per cent., so that a similar drop was felt to be almost certain. Private cable news received reported :—

Snowwhites....................Unchanged;
Sup. long combing...........Par to 5 per cent. lower;
Heavy combings.............½d. to fully ½d. lower;
Short grease................Par to 5 per cent. lower;

with all classes of buyers well represented and good competition.

The weakening tendency can be ascribed partly to political and labour troubles on the other side—the home trade being influenced by the strikes amongst cotton and woollen operatives, and the fear of an impending coal strike, whilst the German section was undoubtedly more cautious owing to the uncertainty as to the result of the parliamentary elections in their country.

The immediate result on the *local market* was a distinct *irregularity in prices.* Light and well-conditioned clips were still eagerly competed for, but heavy and inferior greases were certainly out of favour. Some big clearances were made during the first three weeks of the month, but the last week has brought a touch of apathy. The position and outlook generally do not however—barring accidents such as internal disorganization of England through strikes, or international political complications—look bad.

Tops which at the corresponding period of last year stood at 27d.–27½d. are now on the the basis of 24½d. which represents a drop of *fully* 10–15 *per cent.* We do not think, however, that, barring accidents, prices will sag away much further, but rather, that as the year advances and long wools become scarcer, we shall find Bradford hardening up again.

It is just the level of prices for tops in Bradford which is the cause of trouble to many up-country farmers at present, who are terribly disappointed with valuations received for their clips. They quite forget when comparing this year's valuations with those of last year, that a drop from 27d. or 27½d. to 24½d. in Bradford means a corresponding drop of ¾d. to 1d. in the grease here.

The local sales which recommenced on the 10th inst. show the following results:—

10th January	5400 bales were offered and		2800 bales sold.	
17th „	4500	„ „	2000	„
24th „	4900	„ „	2200	„
31st „	5000	„ „	1500	„

Together with private sales it can be estimated that over 15,000 bales have been cleared during the current month, while stocks in town number about 25,000 bales.

We quote as follows:—

	d.		d.
Transkei grease	6	to	7
Basuto grease	5	„	5⅝
Ordinary native grease	5	„	5½
Super long-skirted Kaffrarian farmers	8	„	10¾
Super short-skirted Kaffrarian farmers	7	„	8½
Good long-grassveld, well-conditioned	6	„	8
Good short grassveld, well-conditioned	5	to	6½
Long northern O.F.S. well-conditioned	6	„	7¼
Long southern O.F.S.	4½	„	6½
Short faulty grease	4	„	5½
Coarse and coloured grease	3	„	5

Mohair has been quiet, although a little business has been doing in native and blue hairs, and also winter hair; stocks in town are small. We quote:—

Superior kids (when available)	17d.	to	19d.
Average kids (when available)	15d.	„	18d.
Winter kids	10d.	„	12d.
Winter hair	7d.	„	8¼d.
Superior long blue mohair	11d.	to	12d.
Average long blue mohair	10d.	„	11d.
Mixed, Orange Free State	9d.	„	10d.
Seconds and greys	5d.	„	6d.
Thirds	4½d.	„	5d.
Basuto hair	9d.	„	10¼d.

Sundry Produce S.D. Hides, 9d. to 9¼d.; D.S. hides, 7¾d. to 8d. Goatskins, 12¼d. to 12½d. Angora skins, 8¼d. to 8½d. Sheepskins, woolled skins, 5d. to 5¼d.; coarse-woolled 4d.; pelts, 2½d. to 2¾d.; Transkei parcels, 3½d. to 3¾d.

DURBAN.

Messrs. Reid & Acutt's Wool Mart, Ltd., Esplanade, Durban, report as follows under date 30th January, 1912:—

Wool.—The month just about to close has not been altogether a satisfactory one from the point of view of sellers. On our first auction for the year, held on 3rd instant, in spite of restricted offerings, the market was distinctly less buoyant owing to rumours of industrial difficulties in manufacturing centres. On 9th instant Antwerp Sales opened with a decline all round in values, and this market thereupon became very quiet, every one being inclined to rest on their oars awaiting the decision of the London Sales, which commenced on the 16th.

On the 12th instant our Bradford correspondents cabled that the Home Market was steady, there being little business doing, but that holders were firm and that the London Sales were expected to open on a steady basis without any alteration in prices. Unfortunately, such was not the case, as, when the sales had got well under way, our London friends cabled on 18th instant that all classes of grease wool were an eighth to a farthing per lb. lower, and on the 24th instant this was followed up by a further cablegram advising that prices had

gone down another 2½ per cent., making in all a decline of from a farthing to a half-penny per lb. in values generally.

This weaker tendency was closely reflected on our auctions, where, during the last two weeks, while competition has been brisk, with a keen inquiry for all classes, values generally have declined from a farthing to a half-penny per lb. Long, light, well-grown wools have, as is invariably the case, suffered least, and such classes have receded only to a barely quotable extent; but heavy-conditioned and fatty wools have declined sharply, and such descriptions are only now saleable at rates up to almost a half-penny under prices ruling at the beginning of the year.

The London Sales are still running as we write, and it is not therefore possible to advise what the final verdict of that centre has been, but it is very evident that under present market conditions we must expect to see a lower basis of prices established.

The following are prices current here to-day:—

NATAL AND EAST GRIQUALAND.

Midlands.	d.		d.
Long light sorted clips	10	to	11½
Unsorted clips, light and clean	8½	,,	10
Bellies, pieces, etc.	4	,,	7½

Ladysmith, Newcastle, Dundee, etc.			
12 months' sorted clips, light and clean	8	to	9
12 months' average clips, light and clean	7¼	,,	8
12 months' heavy and faulty	6½	,,	6¾
6 to 9 months' light and clean	6	,,	6¾
6 to 9 ,, heavy and faulty	5¼	,,	5¾

Utrecht and Vryheid.	d.		d.
12 months' sorted clips, light and clean	7½	to	8½
12 months' average clips, light and clean	6½	,,	7
12 months' heavy and faulty	6	,,	6½
6 to 9 months' light and clean	5¾	,,	6¼
6 to 9 ,, heavy and faulty	5	,,	5½

East Griqualand.			
12 months' sorted clips, light and clean	8	to	9
12 months' average clips, light and clean	7	,,	7¾
12 months' heavy and faulty	6	,,	6½
6 to 9 months' light and clean	6	,,	6½
6 to 9 ,, heavy and faulty	5¼	,,	5½

TRANSVAAL.

Volksrust, Wakkerstroom, Ermelo, Amersfoort, etc.	d.		d.
12 months' sorted clips, light and clean	7½	to	8¾
12 months' average clips, light and clean	6¾	,,	7¼
12 months' heavy and faulty	6½	,,	6¾
6 to 9 months' light and clean	6	,,	6½
6 to 9 ,, heavy and faulty	5½	,,	6

Standerton, Bethal, Middelburg, etc.	d.		d.
12 months' sorted clips, light and clean	7	to	8
12 months' average clips, light and clean	6½	,,	7
12 months' heavy and faulty	6¼	to	6½
6 to 9 months' light and clean	5¾	,,	6½
6 to 9 ,, heavy and faulty	5	,,	5½

Heidelberg, Pretoria, Potchefstroom, Klerksdorp, Lichtenburg, etc.			
12 months' sorted clips, light and clean	7	to	7½
12 months' average clips, light and clean	6¼	,,	6¾
12 months' heavy and faulty	5¾	,,	6¼
6 to 9 months' light and clean	5½	,,	6
6 to 9 ,, heavy and faulty	4¾	,,	5¼

ORANGE FREE STATE.

Harrismith, Vrede, Bethlehem, Heilbron, etc.	d.		d.
12 months' sorted clips, light and clean	7½	to	9
12 months' average clips, light and clean	6½	,,	7
12 months' heavy and faulty	6	,,	6½
6 to 9 months' light and clean	6	,,	6½
6 to 9 ,, heavy and faulty	5½	,,	6

Lindley, Kroonstad, Vredefort, Parys, etc.			
12 months' sorted clips, light and clean	7	to	8¼
12 months' average clips, light and clean	6¼	,,	7
12 months' heavy and faulty	6	,,	6¼
6 to 9 months' light and clean	5¾	to	6¼
6 to 9 ,, heavy and faulty	4¾	,,	5½

Senekal, Ficksburg, Ladybrand, Winburg, etc.	d.		d.
12 months' sorted clips, light and clean	7	to	7¾
12 months' average clips, light and clean	6¼	,,	6¾
12 months' heavy and faulty	5¾	,,	6¼
6 to 9 months' light and clean	5½	,,	6¼
6 to 9 ,, heavy and faulty	4¾	,,	5½

Coarse and Coloured.			
Free from kemps	4	to	5
Ordinary	3	,,	4
Inferior, kempy, and Persian	1	,,	2

TRANSKEI.

	d. d.		d. d.
Even quality, light and clean	6 to 7	Even quality, wasty	6 to 6½

BASUTOLAND AND NATIVE WOOLS.

	d. d.		d. d.
Superior lots, light and clean	5½ to 6½	Average lots, heavy and wasty	4½ to 5
Average lots, light and clean	5 „ 5½		

MOHAIR.

	d. d.		d. d.
Kids, good length and super quality	13 to 16	Ordinary lots	8 to 9
Long blue, super quality	11 „ 12½	Short and mixed winter	7 „ 8
„ average	10 „ 11	Inferior and coloured	4 „ 6

BASUTOLAND AND NATIVE MOHAIR.

	d. d.		d. d.
Average lots, mixed quality	9 to 10	Average lots, inferior	6 to 8

HIDES, SKINS, HORNS, AND BARK

Hides.—Sundried, 14 to 20 lb. average, 8d. to 8½d. per lb.; sundried, inferior, 5d. to 7d.; salted, 6½d. to 7½d.

Sheepskins.—Long-woolled, 4½d. to 4¾d. per lb.; short-woolled, 3d. to 4d. Pelts, 1d. to 2½d.; coarse and coloured, 2d. to 3½d.; salted, heavy, 3½d. to 4d.

Goatskins.—Mixed parcels, sound, 3d. to 4d. per lb.; inferior, 1d. to 2½d.

Horns.—3d. to 10d. per pair.

Wattle Bark.—Cut and bagged, good colour and quality, 5s. 6d. to 6s. per cwt.; cut and bagged, inferior colour and quality, 4s. 6d. to 5s.; uncut in bundles, good colour and quality, 4s. to 5s.; uncut in bundles, inferior colour and quality, 2s. to 4s.

Outbreaks of Animal Diseases.

THE following outbreaks of infectious and contagious animal diseases have occurred in the areas specified during the month ended 31st December, 1911:—

CAPE PROVINCE PROPER

(EXCLUDING TRANSKEIAN TERRITORIES).

Anthrax.

District.	Area	No. of deaths.	No. of incontacts.
Barkly West....................	Boetsap.....................	11	Unknown
,, ...	Klein Boetsap................	1	,,
,, ...	Likatlong....................	2	,,
Mafeking.....................	Kingswell....................	1	,,
Kingwilliamstown..........	Ziklahleni Location...........	1	,,
Stutterheim....................	Commonage..................	1	,,
Kuruman................... ..	Farm Coz....................	1	,,

Glanders.

District.	Area.	Clinically affected and destroyed.	Reacted to test and destroyed.	No. of contacts tested.
Cape....................	Claremont............	1	Nil	Nil
Peddie.................	Barnfather............	1	Nil	Nil
Montagu.................	Montagu..............	1	1	10
Victoria East...........	Alice.................	2	—	1
Wodehouse.............	Doredrecht...........	1	1	6

Equine Scabies.

District.	Area.	No. infected.	No. of incontact animals.
Cape.........................	Wynberg....................	1	1
Cape.........................	Wynberg....................	1	1
Swellendam..................	Swellendam................	1	2
Stockenstroom................	Bellvale....................	1	Nil
Humansdorp..................	Hankey.....................	1	Nil

Tuberculosis.

District.	Area.	No. of animals tested.	No. of reactions to test.	No. of doubtful reactions to test.
Cape	Various	161	6	6
Malmesbury	Various	58	Nil	Nil
Paarl	French Hock	27	Nil	2
Piquetberg	De Tuin	33	11	Nil
Stellenbosch	Various	99	3	Nil

TRANSVAAL.

Disease.	*District.*	*Name of Farm.*
East Coast fever	Carolina	Brandyval No. 177.
	Carolina	Weergevonden No. 34.
	Zoutpansberg	Boschkoppie No. 96.
		Rietfontein No. 70.
Lung sickness	Rustenburg	Paardekraal No. 388.
	Krugersdorp	Waterval West No. 57.
Anthrax	Heidelberg	Vereeniging (two outbreaks).
	Witwatersrand	Driefontein No. 1.
	Lydenburg	Middela.
	Pretoria	Leuwpan No. 49.
		Witklip No. 70.
		Lynwood.
	Wolmaransstad	Harriesburg.
	Wakkerstroom	Straightkraal No. 98.
		Mezie No. 174.
Tuberculosis	Middelburg	Middelburg.
	Pretoria	Rureia.
		Kalkheuvel No 389.
	Krugersdorp	In town.
Mange	Witwatersrand	Johannesburg.

ORANGE FREE STATE.

Disease.	*District.*	*Name of Farm.*
Anthrax	Boshoff	Knapdaar.
		Rietput.
	Kroonstad	Eendorn.

Notes on the Weather.

NATAL PROVINCE.—DECEMBER.

The weather at Durban during December was practically a continuation of that experienced in the preceding month; dull days predominated that often ended in misty rain, with occasional spells of a day or two of clearer sky followed by warm, close evenings. Thunder was noticed on the 1st, 9th, 21st, and 25th. On the 21st distant thunder was heard from 7·50 a.m., continuing at intervals during the day, the shade temperature rose to 94°, while the black bulb thermometer registered 152·5°, and a duststorm sprang up about 2 p.m., though no rain fell until night.

Temperature (Natal), December.

Station.	Mean Maximum.	Mean Minimum.	Monthly Mean.	Abs. Maximum.	Abs. Minimum.	Mean Daily Range.
Observatory, Durban	81·5	68·3	74·9	94	60	13·2
Stanger	85·5	65·6	75·6	110	59	19·9
Verulam	87·1	67·1	77·1	106	60	20·0
Hillary	78·7	66·7	72·7	96	59	12·0
Umbogintwini	83·4	67·7	75·5	95	62	15·7
Winkle Spruit	81·2	65·4	73·3	97	58	15·8
Port Shepstone	82·3	65·3	73·8	89	57	17·0
Imbizana	81·4	64·0	72·7	92	55	17·4
Umzinto	91·3	52·7	72·0	96	50	38·6
Mid-Illovo	73·7	61·0	67·4	96	52	12·7
Bulwer	73·8	54·1	63·9	89	43	19·7
Himeville	82·1	53·4	67·8	95	48	28·7
Richmond	78·6	58·8	68·7	99	51	19·8
Pietermaritzburg	82·2	61·0	71·6	105	54	21·2
Cedara Vlei	80·2	57·4	68·8	98	49	22·8
Howick	81·6	58·5	70·0	97	51	23·1
New Hanover	90·6	59·7	75·1	104	47	30·9
Krantzkop	88·7	68·8	78·8	97	61	19·9
Greytown	87·7	57·8	72·8	104	50	29·9
Lidgetton	85·8	48·8	67·3	100	43	37·0
Nottingham Road	84·1	52·5	68·3	94	42	31·6
Estcourt	98·1	56·6	77·3	108	49	41·5
Weenen	96·6	59·4	78·0	109	53	37·2
Mpofana	86·2	60·2	73·2	103	51	26·0
Ladysmith	95·2	62·2	78·7	108	56	33·0
Dundee	91·2	61·4	76·3	100	52	29·8
Newcastle	91·9	57·1	74·5	103	50	34·8
Vryheid	84·1	60·4	72·3	100	52	23·7
Paulpietersburg	90·4	60·4	75·4	99	55	30·0
Ngomi Forest	77·7	57·4	67·5	94	44	20·3
Ubombo	82·1	69·4	75·8	99	56	12·7
Hlabisa	83·5	66·1	74·8	98	58	17·4
Mahlabatini	86·6	53·8	70·2	101	48	32·8
Melmoth	82·8	62·7	72·7	105	52	20·1
Empangeni	88·6	67·2	77·9	107	58	21·4
Mtunzini	88·6	51·8	70·2	101	40	36·8
Ingwavuma	81·9	63·8	72·9	101	56	18·1
Means	85·1	60·7	72·9	—	—	24·4
Extremes	—	—	—	110	40	—

The coastal rainfall averaged 4·50 inches on 15 days, which is very close to the November average, but elsewhere the precipitation was not so heavy as in the preceding month, the figures being approximately :—Midlands, 3·62 inches on 17 days; Northern Stations. 2·46 inches on 12 days; Zululand, 2·64 inches on 8 days. On the whole the rain was well distributed throughout the month. Hail was reported from Stanger on 1st, from Bulwer on 7th, "doing considerable damage to fruit, etc.", from Utrecht on the same date, from Nottingham Road on 16th, from Colenso on 17th, from Richmond neighbourhood on 21st, and from Weenen on 30th. Thunderstorms were frequent in the Midlands, especially during the first half of the month.

OBSERVERS' NOTES.

Imbizana.—The rainfall for the month, 3½ inches, is considerably under the average for December; it has been sufficient to keep the crops growing, but the springs are very low, The temperature for the month ha been well above the average, but good growing weather. Owing to the exceptional season grubs of all kinds have been very bad this spring and the crops have suffered accordingly, otherwise they are looking well. On farms where cattle have been saved they are in grand condition. (C. H. Mitchell.)

Mid-Illovo—During this month, as in last, there have been an unusual number of misty days, and although the total rainfall was only 4·46 inches (including ·80 inches on the 5th), rain was registered on 24 days. On the 17th about 10·15 a.m. a sound like a distant explosion was heard, followed by a low rumble, such as might be caused by an earthquake, and tremor. On the 21st a hot gale ran the thermometer up to 96° in the shade, followed by a short, sharp thunderstorm—hail and a lightning fatality being reported from the Richmond District. The bulk of the mealie crop has now been planted and is looking promising. Stock is in good condition, and only very few cases of horse-sickness have been reported, though owing to the continuous damp weather mosquitoes are more numerous than usual. (J. W. V. Montgomery.)

Nottingham Road.—December has been exceptionally dry and very hot; drought has affected the crops, and a very large acreage of grass for winter food has been destroyed by the heat. On the 23rd a remarkable change of temperature was experienced, the thermometer falling from 92° in the day to 42° at night. No severe hailstorms.

Ladysmith—The weather during the month has been exceedingly hot and dry, the prevailing winds blowing from the plateau of the high veld, west and north-west, aggravating the conditions, which were but slightly ameliorated by gentle evening breezes from the south-east, bringing no rain. Average daily maximum at Ladysmith was 95° as against 87° for December, 1910, the rainfall being 1·44 inches against 3·83 inches for December, 1910. Early in the month a severe thunderstorm at Bergville resulted in the loss of several sheep and cattle which were struck by lightning. The drought will, it is stated, cause great damage to maize and potato crops. (J. C. Haycroft.)

Mpofana.—Very hot and dry month in most parts. Good rains on hills in Krantzkop and Nkandhla Districts; few hailstorms, especially on Umsinga and Qudeni mountains. Severe hailstorm at junction of Tugela and Sundays Rivers on 30th; three natives killed. Agricultural prospects seem very gloomy; the ground has been too hard to plough, the result being that the year has closed before the mealie crops have been sown. Early mealies on dry lands are standing almost fully grown, but scorched white and quite dead. (R. A. L. Brandon.)

Ngomi Forest.—From December 1st to 12th rain was registered here every day, and during the month rain has been registered on 23 days, 6·77 inches having fallen. This is much lower than December, 1909 and 1910, 18·75 inches and 11·38 inches respectively being the figures for those months. On the 12th and 28th we had heavy thunderstorms, that on the 28th being the most severe when 1·73 inches fell. Maximum temperature for the month was 94° which was recorded on 21st; on that day it was 93° at 4 p.m. and 80° at 8 p.m., wind north-west all day, changing at 9 p.m. to south, which brought up mist and rain. Means for month: maximum 77·7°, minimum 57·4°. Crops in the district are looking well and seem to have recovered from damage done by hail in November. Cattle that are in the district are in good condition. (W. H. Foster.)

Nongoma.—No rain fell till the 23rd and then only a very light shower. Thunderstorms threatened and clouds gathered now and then, but came to nothing. The rains during the latter part of the month saved the crops in the district. The weather was mild during the earlier part of the month; during the latter part some very hot days were experienced, especially on 31st. Crops are poor in the low veld, but good crops are expected on the high veld. The natives commenced to eat green mealies during the last fortnight in December. Stock doing well; grazing good. Horse-sickness is very prevalent, and a very bad season has set in. (T. R. Bennett, jun.)

Empangeni.—The weather has been very hot indeed, more especially on the 12th, 21st, and 31st; on the last two dates the temperature rose to 107°. On the 28th there was

a very bad storm, perhaps the worst I have experienced in this part during 2½ years. The lightning was very bad indeed; the storm broke about 9·30 p.m. and there were some terrible flashes, but I have not heard of any damage done. Stock and crops in district looking well, but rain is needed owing to the excessive heat. (H. Tarboton.)

TRANSVAAL.—DECEMBER.

SUMMARY.—The month was an exceptionally dry one, in most districts the rainfall having been considerably below the average. In the Standerton District, however, the average was just reached, and in the Bethal, Lichtenburg, Piet Retief, and North Lydenburg Districts there was a slight excess. The season's rainfall (six months) shows a serious deficit over the western half of the Transvaal (excepting the Lichtenburg District) and in the Zoutpansberg, Ermelo, and Barberton Districts. There has been a slight excess along the south-eastern border and in the Standerton, Lichtenburg, and Lydenburg Districts.

OBSERVERS' WEATHER REPORTS.

BETHAL DISTRICT—

Leeuwkuilen.—The past month has been one of the driest and hottest that has been experienced for the past twenty-four years. With the exception of the 7th and 8th of the month, there has been no rain to do any good. Severe thunderstorms and accidents by lightning have been frequent in the vicinity. My neighbour had eight wattle trees struck at the same time; the trees were separated over a space of about 25 yards in diameter. The wind was exceptionally strong on the 7th and 8th, birds being killed and big trees blown down. (W. J. Wayland.)

BLOEMHOF DISTRICT—

Zoutpan No. 169.—The heat during the greater part of this month, especially from about the 16th, has been very great, and the veld, which in the beginning of the month was green and flourishing, is, to-day, yellow and parched. Very hot winds from the west have been experienced daily since the 16th. (W. G. C. Andrews.)

ERMELO DISTRICT—

Amsterdam.—The month has been an unprecedentedly hot one and the rainfall greatly below the average. (Capt. C. W. Alston.)

Ermelo.—The heat during this month has beaten all previous records, and the drought has killed both crops and vegetation. (Mrs. S. M. Nicolson.)

Fettercairn.—The month has been rather dry, but good rains fell on the 7th and 8th. On the evening and night of the 8th over 2 inches of rain fell, accompanied by fairly large hail. Thunderstorms were experienced nearly every day about 4–6 p.m., and the lightning has done a lot of damage in the vicinity. (A. Middelton.)

LICHTENBURG DISTRICT—

Doornbult.—Intensely hot weather was experienced between the 12th and 27th of the month such as has not been experienced for the last twenty years. (J. S. G. Smith.)

LYDENBURG DISTRICT—

Belfast.—The month has been a very dry one and the heat exceptional for this part. Slight hailstorms were experienced during the month with heavy local showers in the district. Rain also appeared to fall very locally. (G. J. Imrie.)

Lydenburg.—Crops and grazing veld suffered greatly from excessive heat and absence of rain experienced during the latter part of the month. Grass in places is already taking on a brown winter aspect. Abnormal temperature still continues, and rain is badly needed. (Sergeant H. G. Caldwell, T.P.)

MARICO DISTRICT—

Kaffirskraal.—The rainfall for December in this portion of Marico has been small; except for a few isolated thundershowers, no rain has fallen. The heat has been intense, and the mealie crop is a total failure. Springs have dried up, and the Klein Marico River has ceased running. The veld now is worse than in the middle of winter, and, altogether, a poor lookout is staring the farmer in the face. (A. Brown.)

MIDDELBURG DISTRICT—

Middelburg.—The feature of this month's weather has been the continuous heat recorded; on no less than seven days was a shade temperature of 90° or over recorded in the town, and on two occasions it reached 93°. In both 1905 (October) and 1908 (January) a shade temperature of 94° was recorded, but the continuance of the high temperatures as occurred during the past month has not been previously recorded. As a consequence the mean maximum, mean minimum, and mean temperatures for the month have reached a previously unrecorded high level. On 20th December a very heavy hailstorm with unusually large hailstones occurred in the town between 7 and 8 o'clock p.m., but several very severe hailstorms have occurred in various parts of the district, stripping fruit trees

of both fruit and leaves, and, in some of the higher parts, doing immense damage to the smaller stock (sheep and goats). I have been informed of losses of over sixty head in one part and of over seventy in another, whilst small buck and other wild game of the open veld have been found dead in many places, killed by the hail, The rainfall this year has been below the average; both the veld grass and crops generally are in consequence backward. (Dr. H. A. Spencer.)

PIET RETIEF DISTRICT—

Cascades.—Weather has been very hot and oppressive during the month; several hailstorms occurred in the vicinity of this station, also a couple of very heavy thunderstorms with vivid lightning and slight hail; wind very strong with every storm. Hot dry winds have been the order of the day. (F. Bresler.)

POTCHEFSTROOM DISTRICT—

Haaskraal.—The latter half of the month has been excessively hot with warm drying winds. (G. G. Moody.)

Kalbashfontein.—The weather has been exceedingly hot: a little rain has fallen in local showers usually following the same course. Water is more scarce than it has been known to be for over twenty years. Crops are all destroyed. (J. Murray.)

STANDERTON DISTRICT—

Standerton.—The weather for the month has been very warm and dry, with the exception of the 7th, when 1·05 inches of rain fell; practically every day thunderstorms with very little rain were experienced. Crops are in a bad way, and the insects have played havoc, especially with the mealie crop. (D. Rane.)

SWAZILAND DISTRICT—

Piggs Peak.—Weather warm and dry, with thunderstorms. (Swaziland Police.)

WAKKERSTROOM DISTRICT—

Wakkerstroom.—This has been the hottest month recorded at this station. Local thunderstorms on sixteen days. (W. Pritchard.)

WATERBERG DISTRICT—

Illawarra.—The weather has been very hot and dry, with strong southerly and westerly winds; the nights have been particularly hot; the 21st was the hottest day on record. (J. A. Manson.)

Nylstroom.—The weather has been exceptionally dry, consequently the crops have suffered considerably; should the weather continue dry all crops are threatened to be totally destroyed. (Constable E. B. Gibson, T.P.)

Rhenosterpoort.—The month has been one of the driest ever experienced by the oldest farmers in this area. Rivers that have never been known to have stopped running before have given out now; the grass is looking yellow and the mealie crop will be a failure. (Constable S. Salter, T.P.)

ZOUTPANSBERG DISTRICT—

Louis Trichard.—Excessive heat has been the chief feature of the month, and it has been so persistent as to entirely neutralize the beneficial effects of the rainfall. A record maximum temperature for this station of 103·5° was registered on Boxing Day, but was exceeded on the 27th when 104·4° was registered in the screen. Unless the drought, intensified as it has been by the heat, is promptly broken, all crops will be in a most parlous state, and a native famine may be anticipated. (Sergeant J. C. N. Clark, T.P.)

Pietersburg.—A very dry month; very little rain; ploughing not yet done in most cases; mealie and other crops drying in most parts of the district; water-courses dry or nearly so; intense heat; nights oppressively hot for last two weeks. (C. C. Hicks.)

Elim (Spelonken).—Such heat has not been experienced here since the 5th October, 1886, when 40° C. (104° F.) was registered just before a terrible thunderstorm burst on us. Local thunderstorms all about, but very little rain. Crops much compromised owing to baking heat. (H. Mingard.)

Tzaneen.—The extreme heat experienced this month has not been known for the last ten years; the crops have been considerably affected thereby. (G. F. Savage.)

Rainfall Returns.

NATAL—DECEMBER

	Inches.		Inches.
Durban (Observatory)	3·54	Lidgetton	3·18
Do. (Point)	3·43	Nottingham Road	3·22
Stanger	9·16	Estcourt	1·91
Verulam	3·58	Weenen	3·20
Hillary	2·97	Mpofana	1·28
Umbogintwini	4·75	Ladysmith	1·44
Winkel Spruit	4·07	Dundee	2·43
Port Shepstone	3·73	Newcastle	2·60
Imbizana	3·55	Utrecht	2·76
Umzinto	2·01	Vryheid	2·90
Mid-Illovo	4·46	Paulpietersburg	2·61
Bulwer	3·82	Ngomi Forest	6·77
Himeville	1·97	Ingwavuma	4·20
Richmond	4·70	Ubombo	1·09
Pietermaritzburg (Asylum)	3·96	Nongoma	2·15
Do. (Burger Street)	3·30	Hlabisa	1·93
Cedara (Vlei)	5·05	Mahlabatini	2·07
Howick	3·90	Melmoth	4·37
New Hanover	3·52	Empangeni	3·03
Krantzkop	5·46	Mtunzini	6·58
Greytown	2·77		

TRANSVAAL DECEMBER

	Inches.		Inches.
Barberton	2·34	Potchefstroom	2·58
Komatipoort	2·68	Klerksdorp	1·90
Bethal	4·83	Pretoria (Arcadia)	2·18
Bloemhof	0·37	Modderfontein	2·27
Christiana	0·66	Rustenburg	1·39
Carolina	3·66	Standerton	4·47
Ermelo	2·11	Mbabane	5·99
De Hoop	3·48	Wakkerstroom	2·84
Heidelberg	1·58	Volksrust	2·41
Vereeniging	1·59	Potgietersrust	2·36
Lichtenburg	4·33	Krugersdorp	0·68
Pilgrims Rest	5·94	Joubert Park	3·38
Belfast	2·81	Observatory	2·34
Zeerust	1·60	Pietersburg	2·21
Middelburg	3·66	Louis Trichardt	1·97
Piet Retief	7·08	Leydsdorp	5·22

ORANGE FREE STATE -NOVEMBER.

BETHLEHEM DISTRICT:	Inches.	BETHULIE DISTRICT.	Inches.
Abersethin	4·54	Town	1·93
Bellevue	4·65	Niet te Weet	1·92
Clifton	3·39		
Kaal Laagte	2·22	BLOEMFONTEIN DISTRICT:	
Kestell	4·87	The City—	
Middelpunt	3·56	Arboretum	2·75
Novo	3·05	Government Laboratories	2·55
Reitz	2·27	Grey College School	2·21
Stolzkop	2·65	St. Michael's School	2·50
Whinburn	3·83	Doornplaat	2·94
Rondehoek	2·77	Dunmanway	1·55

BLOEMFONTEIN DISTRICT (*contd.*):	*Inches.*
Ellerslie North	3·48
Glen Lyon	1·63
Mazelspoort	1·95
Nieuwjaarsfontein	4·36
Pakpoort	1·98
Reddersburg	3·16
Retreat	2·62
Roodepoort	3·88
Kromdraai	2·58
Tempe	2·79
Witkops	3·95

BOSHOF DISTRICT:	
Beginseldam	2·55
Brakfontein	2·71
Dealesville	1·71
Eagels Nest	1·57
Kalkpan	2·89
Kanonfontein	3·23
Knapdaar	1·53
Mahemsvley	2·75
Smithskraal	1·16

EDENBURG DISTRICT:	
Bethany Village	1·61

FAURESMITH DISTRICT	
Koffyfontein	1·84
Middelfontein	2·63
Mimosa	2·44
Fevredenheid	2·63

FRANKFORT DISTRICT:	
Town	5·98
Muirton	3·82
Dunedin	3·73
Vryheid	4·17

HARRISMITH DISTRICT:	
Afrika's Kop	3·93
Arbeid Adelt	3·27
Buckland Downs	3·38
Tandjesberg	5·09
Forest Station	5·24
Mill Barton	4·37
Hermitage	5·61

FICKSBURG DISTRICT:	
Caledon Draai	1·87
Dekselfontein	4·53
Dunblane	2·84
Dunelm	2·58
Fouriesburg	2·35
Gunton	3·20
Imperani	2·61
Kalkoenkrantz	2·64
Kranskloof	2·13
Lusthof	2·47
Prynnsberg	2·40
Zuikerkop	2·49
Sandford	2·92
Kirklington	1·64

JACOBSDAL DISTRICT:	*Inches.*
Town	3·23
Aschboschdam	3·48
Aurora	3·95
Koppieskraal	1·45
Zoutpan	2·61

KROONSTAD DISTRICT:	*Inches.*
Town	1·67
Geduldfontein	1·48
Geelbekfontein	1·49
Hebron	3·29
Holfontein	2·84
Vierfontein Mine	4·43
Voorspoed	1·70
Waterford	3·25

LADYBRAND DISTRICT.	
Town	6·15
Alma	4·17
Braemar	3·05
Clocolan	3·37
Government Nursery	5·69
Lambertina	2·80
Modderpoort	4·64
Mona	3·54
New Vale	6·05
Westminster	4·67
Zorgvliet	4·27
Rangershoek	4·24

HEILBRON DISTRICT:	
Beltrim	5·47
Kroonbank	2·01
Springbokvlaakte	4·15
Villiers	4·78

HOOPSTAD DISTRICT.	
Town	2·64
Commando Drift	1·75
Fairfield	3·00
Klippan	2·18
Rietkuil	3·18
Roodepoort	2·64

LINDLEY DISTRICT:	
Town	3·15
Kerry	2·46
Lindley Road	3·02
Waterford	3·25
Wexford	3·38

PHILIPPOLIS DISTRICT:	
Donkerpoort	1·97
Highbury	2·50

ROUXVILLE DISTRICT:	
Town	3·69
Cleanwater	5·55
La Mortola	4·24
Middelplaats	3·66
Oudefontein	2·70
Riversdale	2·74
Sterkfontein	3·74

SMITHFIELD DISTRICT:	Inches.
Helvetia	3·65
Holstein	5·75

THABA 'NCHU DISTRICT:	
Town	3·19
Burgundy	5·17
Fort Bassett	5·42
Leeuw River Mills	4·71
Moroka Industrial School	2·88
Rockwood	3·64
The Cliff	3·59
Tweespruit	3·76
Wilgeboom Nek	3·07
York	4·05
Likatlong	2·46

VREDE DISTRICT:	
Town	5·99
Fairplay	7·41
Woudzicht	3·72

VREDEFORT DISTRICT:	Inches.
Bloemhof	3·48
Bodeskraal	2·60

WEPENER DISTRICT:	
Lucerne Valley	2·97
Mon Repos	5·01
Wonderboom	4·15

WINBURG DISTRICT:	
Town	2·14
Bantry	2·56
Beddington	2·80
Burnet Holm	1·45
Excelsior	3·34
Foxhill	2·67
Grootkuil	1·72
Hayfield	1·75
Paardekraal	2·77
Roodekop	2·50
Smaldeel	2·01
Vaalbankskuil	1·40
Wildebeestefontein	1·76

Results of Egg-Laying Competitions.

WESTERN PROVINCE AGRICULTURAL SOCIETY.

Fourth Egg-Laying Competition.—16th May, 1911, to 15th May, 1912.

RECORD FOR DECEMBER, 1911, AND TOTALS TO END OF DECEMBER.

Pen Number.	Owner	Breed (Six Birds to a Pen)	Record for Month. Eggs.	Weight. oz	drms	Total to Date. Eggs.	Weight. oz.	drms.	Position to Date.
1	F. W. Nicholson..	Buff Orpingtons..............	48	99	2	340	717	2	25th
2	F. T. Hobbs	Silver Wyandottes............	61	119	0	388	759	11	24th
3	A. Riley.........	Black Minorcas (R.C.).........	45	91	4	277	547	0	26th
4	N. Cole	White Leghorns (Amer.)	81	159	7	463	907	13	18th
5	S. T. Jones	White Leghorns (Amer.)	51	113	15	165	1002	6	12th
6	H. Curtis..	White Leghorns (Amer.)	52	109	13	491	1022	2	11th
7	S. C. Skaife......	White Wyandottes............	76	141	1	428	774	6	22nd
8	A. Keppie.......	White Wyandottes............	40	72	3	441	817	13	21st
9	S. A. West.......	White Leghorns (Amer.-Danish) (5 birds only; 1 died 5/11/11.)	58	127	15	451	977	13	14th
10	H. H. Bright.....	Black Leghorns	78	155	2	620	1229	2	4th
11	B. Kauffmann ...	Brown Leghorns	69	132	2	481	975	11	15th
12	B. Kauffmann ...	Black Leghorns	63	135	12	152	972	9	16th
13	C. W. Pilkington .	Rhode Island Reds	73	151	12	352	770	10	23rd
14	W. P. Cowan	White Leghorns (Eng.)........	73	145	13	610	1184	4	5th
15	A. J. Stacy......	White Leghorns (Aust.-Amer.) (Re-entered from last competition for second year test.)	85	176	14	624	1313	0	1st
16	B. Kauffmann ...	White Leghorns (Eng.-Amer.).. (5 birds only; 1 died 18/11/11.)	75	156	8	565	1173	5	6th
17	S. Smith	Brown Leghorns	26	54	1	421	862	2	19th
18	Mrs. H. H. Bright	White Leghorns (Aust.)....... (4 birds only; 2 died 2/11/11.)	60	119	14	554	1052	5	9th
19	N. Cole	White Leghorns (Amer.)	60	125	2	506	1059	4	8th
20	F. Molteno	Leghorns....................	55	100	5	515	949	1	17th
21	C. H. van Breda..	White Leghorns (Aust.)	75	142	3	656	1273	12	2nd
22	Mrs. C. H. van Breda	White Leghorns (Amer.).......	66	129	15	533	1036	2	10th
23	S. A. West.......	Brown Leghorns	50	93	7	522	988	7	13th
24	Graham, Hope & Co.	White Wyandottes	104	209	0	548	1090	9	7th
25	R. V. R. Jones...	White Leghorns (Amer.-Aust.) .	52	104	7	430	838	15	20th
26	S. Smith	White Leghorns (Dan. & Amer.)	—	173	0	649	1241	12	3rd

REPLACEMENTS (SCORES DEDUCTED FROM PEN TOTALS).

Pen No. 3 —No. 17 died. Replaced 23rd October. Score, 68 eggs; weight, 123 ozs. 5 drms.
Pen No. 4.—No. 22 died. Replaced 4th November. Score, 62 eggs; weight, 110 ozs. 14 drms.
Pen No. 5.—No. 28 died. Replaced 26th October. Score, 39 eggs; weight, 80 ozs. 14 drms.
Pen No. 6.—No. 31 died. Replaced 22nd November. Score, 58 eggs; weight, 124 ozs. 11 drms.
Pen No. 11.—No. 65 died. Replaced 3rd November. Score, 63 eggs; weight, 140 ozs. 10 drms.
Pen No. 12.—No. 67 died. Replaced 28th September. Score, 38 eggs; weight, 78 ozs. 4 drms.
Pen No. 19.—No. 112 died. Replaced 27th August. Score, 35 eggs; weight, 74 ozs. 10 drms.

MANAGER'S REPORT FOR DECEMBER. 1911.

The total number of eggs for the month is 1675, a drop of 104 as compared with that for November. Some of the good layers have kept up their averages well, while the medium and poor ones have failed to do so. The drop is also due in a slight measure to some of the birds being in moult and to broodiness, also some of the birds lacking stamina, and others of poor laying strains have not done well. The highest total in one day was 72 eggs, the lowest 39. The eight pens with the highest totals of eggs are :—Pen No. 24, 104 ; pen No. 26, 90 ; pen No. 15, 88 ; pen No. 4, 81 ; pen No. 10, 78 ; pen No. 7, 76 ; and pens No. 16 and No. 21, each 75.

The highest individual scores in number of eggs are :—No. 89, 28 eggs ; No. 56, 22 ; No. 144, 22 ; No. 19, 21 ; No. 94, 21 ; and Nos. 36, 62, and 139, each 20.

And in weight are :—No. 89, 60½ oz. ; No. 56, 43 oz. 3 drms. ; No. 144, 42 oz. 7 drms. ; No. 19, 41 oz. 2 drms. ; No. 94, 44 oz. 1 drm. ; No. 36, 43 oz. 2 drms. ; No. 62, 38 oz. 1 drm. ; No. 139, 40 oz. 11 drms.

The total should certainly have been greater, even at this time of the year, had all the pens laid as well as pen No. 24, for instance. The profit, after deducting the food bill would have been in the neighbourhood of £15 for the month : as it is, it works out roughly at about £5, which is a good object-lesson in favour of keeping only birds of the best laying strains ; it pays hands down to do so. Whereas to breed from all and sundry or only the medium and not the best layers and these alone, usually results in a balance on the debit side. As an instance of the futility of this procedure, I should like to mention that I recently heard of two cases, one, in which from eighty layers, the weekly production was an average of one egg per hen, the other in which 200 hens produced an average of just over one egg per bird per fortnight. Just think of it. Is there any wonder we have to import eggs ? Possibly these are extreme cases; I hope so. There is no doubt the birds are of all ages, the majority drones, and that they receive little or no care. In such cases every bird over two years old should be got rid of at once : those combining the best laying qualities *and* strongest constitutions and stamina chosen from the residue, and the others discarded. Even if this reduce the flock by 75 per cent., a few good strong birds of good laying strain, properly looked after, are a source of profit and pleasure to their owner. A large number of good, bad, and indifferent ones, on the other hand, mean loss, trouble, and annoyance. Take the two cases above mentioned ; probably many of the birds lay a maximum of twenty to thirty eggs per year; these are bred from, with the result that their progeny lay a similar or even fewer number, a son of one of them is used for breeding, and stamps these estimable (?) qualities upon every one of his daughters, and so it goes on year after year. The urgent need there is for weeding out all old birds and drones, to be replaced by those of good laying strains cannot be too frequently or too emphatically impressed upon all farmers and poultry keepers throughout the country.

I alluded above to pen No. 24. The birds in it are from a farm in England where trap nests are used extensively (I know every farmer has not the time to spare to attend to trap nests, but there are other methods of spotting the best layers with a fair amount of accuracy) only the best layers and—a most important point—the strongest of these are bred from and, in the case of heavy breeds, only those birds also which show the least signs of broodiness, and it is quite possible for any and every farmer and poultry keeper to adopt such methods ; and, if all did so, we should soon have a very substantial output of eggs in this country.

Fowls properly bred, i.e. from the best layers with the strongest constitutions, and properly cared for, pay well, and value for value much better than any other stock on the farm. Apropos of this, I recently heard that a poultry farmer in Tasmania offered to run twenty-five pure-bred pullets against any dairy cow in the State to decide which would yield the greatest profit. In each case all food supplied was to be charged and the produce sold in the usual way. It is rather suggestive that the challenge was not accepted. It is well worth a trial in this country to prove to the farmer and poultry keepers generally the relative value of poultry. Many of the former take any amount of trouble with their larger stock, but neglect their hens and then say they "don't pay". A competition on these lines between various classes of stock would be most valuable and probably astonish those who are inclined to despise the hen.

The health of the birds :—I am glad to report that, with the exception of one slight case of catarrh, there has this month been a clean bill of health. Some of the birds which do not possess particularly strong constitutions and which lack stamina, are to a certain extent rather run down with the strain of laying. Of course in such a competition one cannot give tonics to these specially (all occasionally are given sulphate of iron in the drinking water), they must take their chance, for it would be unfair to those birds rejoicing in strength, stamina, and sound constitutions, and these latter are the ones which will score from now to the end of the competition. The usual cause of want of stamina is breeding from birds with the same fault or some set-back during chickenhood ; the remedies are therefore obvious.

Many of the birds are moulting, some quickly I am glad to say. It would be an advantage to run them all into moult together; that of course cannot be done here; but I would recommend this procedure very strongly to poultry farmers, it saves a great deal of trouble and time. The birds can be got through it, and laying again before the autumn is well advanced, instead of as is so often the case it is protracted to the end of that season, and sometimes into the winter, which means no eggs from these birds till the spring. To get the birds through their moult as quickly as possible they are being given in their evening mash feed stewed linseed (a small quantity) three times a week, flowers of sulphur once a week (choosing a warm, dry day), and chopped green lucerne; the last hung up in bundles for them to pick at is also always before them. I find that they require more than they will eat voluntarily, especially in the hot weather they cannot have too much. Cabbages provide the best green food during the moulting season, but these are not available in sufficient quantities, but they are fed occasionally. Permanganate of potash is also added frequently to the drinking water; this prevents colds which fowls when moulting are liable to get.

Twenty-nine birds, including four light breed ones, have been broody during the month, thirteen of these being affected twice, the majority of them after laying from four to eight eggs between the two attacks.

The weather during the month has been very changeable; although the majority of days have been warm and bright we have had several cold nights, especially that of the 28th, when the temperature dropped very suddenly about 9 p.m. Rain has fallen on nine occasions, the night of the 27th being the wettest and stormiest experienced since the commencement of the competition. We have also had our fair share of wind, south-east and north-west in about equal quantity; but I am glad to say these changes have had no ill effect on the health of the birds, although they may possibly have been another contributing factor in the drop in the egg output. Often in spite of all care, chills and colds among poultry are common during variable weather and more especially in breeding pens where these have to be kept in confined areas. It is the first stage which really counts; if discovered, then further developments can usually be checked, which neglected may lead to much trouble and loss. The poultry keeper should therefore be prepared and ever on the look out for early signs.

ARTHUR LITTLE,
Manager.

CEDARA.

DECEMBER AND FINAL RESULTS.
(Competition commenced 9th July, 1911.)

NOTE. Each Pen consists of four Pullets

No. of Pen.	Owner.	Breed.	December. No. of Eggs.	December. Weight. lb.	oz.	Total No. of Eggs.	Total Weight. lb.	oz.
17	Mr. J. J. Mann	W.W.	62	6	9½	290	30	8½
12	Mr. Guy Blundell	W.L.	54	6	15	273	35	10½
1	Mr. Greenough	W.L.	47	5	11	258	32	1
3	Mr. Firmstone	B.O.	47	5	6½	254	27	12½
2	Mr. Doidge	W.W.	59	7	7½	247	31	4½
6	Mr. Chapman	B.O.	47	5	4	243	27	1
8	Mr. Stranack	W.W.	37	4	2½	233	26	14
11	Mr. Coupland Ferguson	W.W.	33	4	1	230	26	5
9	Mr. Dewar	S.W.	41	4	3	227	23	0
10	Mr. J. J. Mann	W.L.	37	4	7½	223	27	9½
4	Mr. Hutt	B.L.	30	3	5½	203	21	2½
16	Mr. Wilson	B.M.	38	4	15	199	25	5
7	Mr. McEwan	W.L.	36	4	11	184	22	11
5	Mr. Mason	W.L.	25	2	12	182	19	6½
14	Mr. Wilson	B.O.	30	3	15½	181	22	9½
13	Mr. Woodward	W.L.	32	4	1½	168	21	2
18	Mr. Hulett	W.L.	29	3	6½	162	19	4½
15	Mr. Wilson	W.L.	31	4	1½	127	16	4½

EXPLANATION OF BREEDS:

W.L.—White Leghorns.	B.L.—Black Leghorns.
W.W.—White Wyandottes.	S.W.—Silver Wyandottes
B.O.—Buff Orpingtons.	B.M.—Black Minorcas.

Maize Export.

BAGS of Maize exported Oversea from the undermentioned Union Provinces and B.S.A. Customs Union States during the month of December, 1911, and the twelve months ended 31st December, 1911 :—

Graded at	Transvaal.		Orange Free State.		Natal.		Cape Province.		Bechuanaland		Basutoland.		Total.	
	1 Month.	12 Months.	1 Month	12 Months	1 Month	12 Months	1 Month.	12 Months	1 Month.	12 Months.	1 Month.	12 Months.	1 Month.	12 Months.
Capetown	—	239,238	—	58,639	—	—	—	—	—	—	—	—	—	297,877
Port Natal...	7,085	229,165	9,705	191,040	925	41,566	—	—	—	—	—	—	17,715	461,771
Port Elizabeth	7,359	148,862	5,088	53,635	—	—	—	—	—	—	—	—	12,447	202,497
East London	-	37,176	—	11,417	—	-	2,909	7,892	—	—	—	—	2,909	56,485
TOTALS	14,444	654,441	14,793	314,731	925	41,566	2,909	7,892	—	—	—	—	33,071	1,018,630
Totals for same periods, 1910.														
TOTALS	28,840	759,830	18,018	794,266	5,533	192,026	—	2,758	—	3,445	—	7,883	52,391	1,760,208

Estimated Maize Crop, Transvaal, 1912.

THE estimated yield of mealies for the year 1912 is considerably lower than the actual yield for the previous year. This is owing to the severe drought during ploughing season and insect pests.

District.	*Actual Yield, 1911, in Bags.*	*Estimated Yield, 1912, in Bags.*
Barberton	14,341	8,000
Bethal	261 992	270,000
Bloemhof	12,574	12,000
Carolina	17,950	17,000
Ermelo	129,788	130,000
Heidelberg	341,871	143,000
Krugersdorp	38,419	22,500
Lichtenburg	212,148	105,000
Lydenburg	39 505	52,500
Marico	15,866	9,500
Middelburg...	249,148	233,500
Piet Retief	29,106	48,000
Potchefstroom	409,508	370,000
Pretoria	170,587	100,000
Rustenburg...	50,045	42,000
Standerton	231,534	230,000
Wakkerstroom	40,654	25,000
Waterberg	64,020	83,000
Witwatersrand	37,333	35,000
Wolmaransstad	49,891	33,000
Zoutpansberg	101,018	149,000
Total for Whites	2,527,298	2,118,000
Total for Natives	650,000	500,000
GRAND TOTAL	3,177,298	2,618,000

Agricultural Statistics—Transvaal.

COMPARATIVE Agricultural Statistics for the Transvaal for the three years ended 30th June, 1909, 30th June, 1910, and 30th June, 1911.

District.	Total No. of Cattle. 1909.	1910.	1911.	Total No. of Horses. 1909.	1910.	1911.	Total No. of Mules. 1909.	1910.	1911.	Total No. of Donkeys. 1909.	1910.	1911.
Barberton	5,238	5,032	7,135	209	204	215	431	405	536	866	951	1,127
Bethal	25,685	27,926	33,024	2,537	2,756	3,396	103	56	32	148	106	169
Bloemhof	26,020	27,740	38,105	2,043	2,201	2,674	102	88	103	1,636	1,539	2,129
Carolina	12,180	13,008	16,957	1,376	1,425	1,955	390	317	309	669	359	415
Ermelo	40,591	44,214	55,068	6,707	6,789	7,239	814	730	747	338	605	756
Heidelberg	41,765	48,587	59,335	3,308	3,359	3,871	530	350	293	435	560	455
Krugersdorp	16,835	18,618	24,093	546	612	685	201	177	141	178	199	293
Lichtenburg	29,978	37,877	43,714	1,333	1,499	1,861	273	139	149	1,684	1,907	2,453
Lydenburg	22,326	27,864	30,602	1,683	2,025	2,600	1,450	982	1,025	1,314	1,625	1,797
Marico	15,640	17,007	16,958	578	654	787	349	332	338	2,893	3,567	3,590
Middelburg	33,933	36,190	52,313	1,809	1,717	2,393	438	386	285	1,126	1,124	1,102
Piet Retief	6,235	8,093	16,495	729	805	1,203	581	614	689	478	542	837
Potchefstroom ...	71,634	77,603	98,773	2,922	2,939	3,805	770	410	437	2,142	3,225	3,565
Pretoria	43,558	55,127	77,451	4,019	4,132	4,553	2,440	2,749	2,782	1,884	1,849	3,285
Rustenburg	33,985	39,874	52,183	801	1,075	1,461	955	965	931	3,628	4,178	4,972
Standerton	34,728	38,075	53,753	6,222	6,928	8,512	286	316	303	207	197	404
Wakkerstroom ...	28,117	31,396	37,209	6,756	7,098	8,869	549	341	454	191	88	140
Waterberg	26,886	29,204	33,482	464	469	663	852	636	931	2,004	2,385	3,216
Witwatersrand ...	26,619	22,320	33,250	6,414	5,485	10,445	4,234	3,524	6,702	711	646	673
Wolmaransstad ...	20,862	24,411	29,747	1,603	1,684	1,984	111	49	79	370	1,001	900
Zoutpansberg	18,443	19,720	26,422	832	853	1,029	1,547	1,592	1,785	8,503	15,023	15,839
Totals for Whites ...	581,258	649,886	836,069	52,891	54,709	70,200	17,406	15,158	19,051	31,405	41,676	48,117
Totals for Natives ...	318,415	339,132	360,000	5,358	5,791	6,000	879	976	1,000	18,042	22,307	25,000
GRAND TOTALS ...	899,673	989,018	1,196,069	58,249	60,500	76,200	18,285	16,134	20,051	49,447	63,983	73,117

District.	Total No. Woolled Sheep.			Total No. Other Sheep.			Total No. Angora Goats.			Total No. Other Goats.		
	1909.	1910.	1911.	1909.	1910.	1911.	1909.	1910.	1911.	1909.	1910.	1911.
Barberton	699	618	925	1,071	1,354	1,457	78	126	497	10,120	13,316	16,028
Bethal	139,793	145,841	148,591	24,947	20,888	18,540	1,799	1,395	2,099	12,343	9,972	11,181
Bloemhof...	70,065	82,488	93,902	97,862	80,917	86,848	60,149	49,678	51,234	16,343	11,748	15,931
Carolina	65,999	83,046	104,420	13,621	12,056	10,156	12,068	10,521	11,258	13,058	7,848	12,392
Ermelo	368,687	376,480	455,171	24,476	20,428	20,310	3,219	2,438	2,820	26,738	22,607	25,268
Heidelberg	128,960	120,969	135,517	60,036	40,957	33,448	8,563	5,763	7,613	30,498	22,965	24,690
Krugersdorp	670	1,420	1,018	20,269	16,103	13,813	3,001	2,609	2,889	6,272	3,885	7,672
Lichtenburg	62,470	58,863	74,771	70,523	72,494	81,076	14,107	12,144	16,554	20,047	14,183	15,346
Lydenburg	80,945	108,160	148,827	23,978	22,005	17,541	26,175	23,110	23,145	26,511	34,044	30,126
Marico	1,055	295	480	26,280	28,993	27,814	2,727	2,158	1,498	19,809	21,566	17,778
Middelburg	68,490	71,597	97,373	35,297	35,320	36,211	9,577	8,929	13,677	44,863	32,401	58,006
Piet Retief	51,719	68,682	78,440	3,498	4,482	9,896	1,974	2,039	2,312	13,333	12,993	45,319
Potchefstroom	58,619	56,328	61,493	90,284	220,105	99,012	21,345	16,149	23,271	48,593	38,281	48,735
Pretoria	18,948	26,500	37,818	64,290	59,238	74,356	2,706	1,741	2,582	25,489	22,363	37,113
Rustenburg	1,141	1,075	1,724	33,879	32,579	30,966	1,687	2,021	1,938	40,570	36,594	37,747
Standerton	320,043	301,589	286,315	21,138	13,062	10,777	6,873	13,845	5,932	11,987	5,020	19,599
Wakkerstroom	403,417	425,282	445,387	6,726	6,603	8,155	14,937	9,430	9,990	19,211	17,102	15,383
Waterberg	164	60	47	30,710	27,485	24,471	96	69	55	27,089	22,374	18,494
Witwatersrand	3,388	1,713	2,002	14,874	12,806	11,174	2,092	1,050	1,456	6,612	5,055	5,791
Wolmaransstad	86,930	84,854	106,971	22,870	41,273	43,289	19,814	15,036	30,770	13,747	16,786	12,734
Zoutpansberg	3,343	3,754	5,444	58,951	58,316	64,741	1,118	1,095	1,318	62,826	60,147	77,089
Totals for Whites ...	1,935,554	2,019,614	2,286,637	745,580	827,464	724,051	214,105	181,346	212,908	496,059	431,250	552,422
Totals for Natives ...	—	—	—	330,772	322,630	350,000	—	—	—	941,726	896,386	1,000,000
GRAND TOTALS ...	1,935,554	2,019,614	2,286,637	1,076,352	1,150,094	1,074,051	—	—	—	1,447,785	1,327,636	1,552,422

District.	Total No. of Pigs.		Total Wool, in lb.		Total No. Bags Mealies.			Total No. Bags Wheat.	
	1910.	1911.	1910.	1911.	1909.	1910.	1911.	1910.	1911.
Barberton	1,108	1,535	2,030	175	11,973	15,593½	14,341	23	390
Bethal	2,989	3,502	633,821	674,758	152,735	205,828½	261,992	6,055	12,111
Bloemhof	1,739	1,948	318,128	502,719	26,889	27,418	12,574	828	457
Carolina	1,439	1,620	407,883	492,677	18,215	20,269½	17,950	2,073½	1,613
Ermelo	5,078	12,355	1,811,839	2,066,473	112,657	120,422	129,788	2,906½	6,171
Heidelberg	5,013	6,525	606,012	680,036	260,723	294,905	341,871	7,903½	13,315
Krugersdorp	1,955	2,643	5,600	2,060	26,484	33,059	38,419	17,083	19,139
Lichtenburg	3,145	3,633	324,786	395,428	120,190	212,483½	212,148	12,808	4,110
Lydenburg	3,486	4,269	510,106	725,059	48,585	43,568	39,505	10,018	15,068
Marico	2,769	2,928	5,580	80	23,717	21,901	15,866	24,315	20,315
Middelburg	4,660	7,556	285,208	447,853	166,033	156,568½	249,148	9,867½	10,070
Piet Retief	945	4,208	309,798	448,484	21,577	31,396	29,106	264	313
Potchefstroom	11,886	14,715	242,209	321,149	274,769	347,849½	409,508	34,373	40,849
Pretoria	5,783	11,063	43,405	88,701	89,048	102,911	170,587	32,785	37,835
Rustenburg	5,771	6,949	3,800	5,172	43,835	46,226½	50,045	49,718	47,306
Standerton	2,453	4,794	1,482,408	1,610,008	175,727	174,852½	231,534	7,567½	14,009
Wakkerstroom	1,578	2,025	2,228,044	2,498,435	39,458	36,766	40,654	2,997	3,337
Waterberg	3,433	3,455	78	30	60,055	64,375½	64,020	6,014½	6,984
Witwatersrand	4,586	5,566	3,190	967	39,979	71,508	37,333	680	435
Wolmaransstad	3,444	2,508	490,432	474,168	64,681	50,775	49,891	817½	1,556
Zoutpansberg	7,608	8,214	16,230	21,147	99,101	100,342	101,018	3,343	4,476
Totals for Whites	80,868	112,011	9,730,587	11,455,579	1,876,197	2,179,018½	2,527,298	232,440½	259,859
Totals for Natives	91,163	100,000	—	—	—	1,176,091	650,000	—	—
GRAND TOTALS	172,031	212,011	9,730,587	11,455,579	1,876,197	3,355,109½	3,177,298	232,440½	259,859

District.	Total No. Bags Oats.		Oat-hay. in lb.		Total No. of Bags Kaffir Corn.			Total No. Bags Potatoes.		
	1910.	1911	1910.	1911	1909.	1910.	1911.	1909.	1910.	1911.
Barberton	—	—	102,112	348,009	860	1,531	2,084	1,301	3,438½	3,994
Bethal	—	1428	5,818,760	5,258,608	3,485	2,852	3,822	5,557	18,852½	16,631
Bloemhof	—	—	285,400	224,316	15,124	3,950½	2,707	962	1,059½	1,040
Carolina	759	328	1,996,120	2,275,920	1,409	1,697	1,406	2,404	5,251	3,393
Ermelo	15,632½	26,432	6,923,348	5,970,900	5,523	2 747	16,968	6,536	9,818½	11,817
Heidelberg	50	325	7,946,816	9,492,824	26,695	16,699	21,365	5,898	12,058	18,979
Krugersdorp	—	—	7,789,948	12,535,840	1,384	605	5,196	6,547	16,868	26,614
Lichtenburg	—	—	1,085,980	1,041,880	25,958	7,676½	14,940	862	1,935	12,165
Lydenburg	682	409	6,741,708	4,498,276	1,073	770	1,342	3,645	9,132½	8,855
Marico	—	267	3,774,476	3,274,080	2,947	801½	2,559	1,133	4,690	5,825
Middelburg	235	5,234	4,207,296	3,473,176	5,274	2,091	8,040	3,009	5,792½	6,785
Piet Retief	—	1,041	773,360	1,377,600	969	2,074	5,236	944	835	811
Potchefstroom	143	143	13,143,976	16,915,688	38,124	31,022½	31,541	22,029	33,150	64,911
Pretoria	13	114	14,912,688	25,097,776	4,689	2,577	12,670	12,182	24,789½	44,946
Rustenburg	12	596	4,211,000	7,423,176	6,668	1,965	6,463	1,543	5,192½	9,491
Standerton	482	5,791	11,469,192	16,139,656	3,874	1,543	7,979	20,476	53,891½	86,998
Wakkerstroom	—	3,979	10,166,400	8,553,288	1,447	1,624	1,527	4,544	6,304½	8,375
Waterberg	120	41	1,410,116	1,200,600	3,914	1,587	2,808	6,116	5,867	7,334
Witwatersrand ...	180	18	2,821,180	5,197,280	1,239	5,961	5,372	11,266	28,145	64,869
Wolmaransstad ...	—	—	71,600	87,400	17,866	2,608½	5,071	171	264	1,755
Zoutpansberg	79	111	2,667,060	2,897,500	11,344	9,804½	13,141	6,005	10,477½	25,605
Totals for Whites ...	18,387½	46,257	108,318,536	133,283,784	179,865	102,187	172,537	123,130	257,812½	431,193
Totals for Natives	—	—	—	—	—	555,657	400,000	—	—	—
GRAND TOTALS ...	18,387½	46,257	1 8,318,536	133,283,784	179,865	657,844	572,537	123,130	257,812½	431,193

District.	Total Tobacco Harvested, in lb.			Total No. of Oranges.		
	1909.	1910.	1911.	1909.	1910.	1191.
Barberton	19,185	21,850	38,670	2,336,600	2,395,020	1,853,570
Bethal	11,281	8,530	7,791	580	2,000	2,900
Bloemhof	5,608	16,350	13,067	21,750	1,442	8,552
Carolina	35,826	42,514	32,923	8,000	15,117	16,000
Ermelo	25,788	9,722	9,000	153,641	33,000	49,329
Heidelberg	7,228	2,900	17,005	40,890	178,418	181,700
Krugersdorp	291,150	561,825	987,938	127,500	1,011,300	404,950
Lichtenburg	25,563	163,954	126,001	1,400	2,250	2,350
Lydenburg	92,957	71,844	99,640	1,529,798	2,266,800	1,717,179
Marico	74,387	102,650	87,316	3,669,726	3,762,370	5,246,800
Middelburg	76,271	199,550	84,237	388,723	323,684	518,161
Piet Retief	289,078	334,392	288,611	734,905	1,784,532	988,325
Potchefstroom	256,205	877,292	843,443	480,590	1,411,015	1,973,945
Pretoria	89,311	109,952	331,886	2,843,600	5,192,504	6,231,228
Rustenburg	1,208,274	2,478,370	4,735,231	12,587,275	14,396,157	18,992,963
Standerton	45,145	13,306	27,592	—	—	400
Wakkerstroom	15,710	11,724	10,310	79,005	65,100	18,000
Waterberg	65,935	66,220	113,010	6,788,322	6,265,217	34,882,747
Witwatersrand	85,335	490	3,430	289,600	130,840	449,940
Wolmaransstad	139	14,720	13,857	4,000	2,000	3,300
Zoutpansberg	171,074	238,275	222,604	1,140,061	4,606,390	1,207,072
Totals for Whites	2,891,450	5,346,430	8,093,562	33,225,966	43,845,156	74,749,411
Totals for Natives	—	—	—	—	—	—
GRAND TOTALS	2,891,450	5,346,430	8,093,562	33,225,966	43,845,156	74,749,411

Importation of Live Stock.

Return showing particulars of certain Pure-Bred Live Stock imported into the Union of South Africa.

Stud-Book No. or Name.	Stud-Book in which Registered.	Breed.	Sex.	Country of Origin.	Importer's Name and Address.
Unknown	Unknown	Hackney	Stallion	U.K.	J. C. Rabie (S.'s son), Nuy, C.P.
No. 3935	Suffolk	—	Stallion	U.K.	J. A. Haworth, Prieska, C.P.
Kings Frost, 1910	English. Vol. XXI	Thoroughbred	Stallion	U.K.	L. G. Bland. Worcester, C.P.
Friend, 1897	English, Vol. XIX	Thoroughbred	Stallion	U.K.	L. G. Bland. Worcester, C.P.
Unknown	Unknown	Roadster, Racer (cross)	Mare	Australia	A. A. Andries, Port Elizabeth.
Unknown	Unknown	Roadster, Racer (cross)	Mare	Australia	A. A. Andries, Port Elizabeth.
Phoenix	English	Thoroughbred	Mare	U.K.	F. B. Morice, Capetown.
Sweetmeat	English	Thoroughbred	Filly	U.K.	F. B. Morice, Capetown.
Lady Smythe	English	Thoroughbred	Filly	U.K.	F. B. Morice, Capetown.
Royal Examiner	Unknown	—	Stallion	U.K.	L. Tepherson, Sir Lowry Road.
Governess	Unknown	—	Mare	U.K.	L. Tepherson. Sir Lowry Road.
Miss Maclean	Unknown	—	Filly	U.K.	L. Tepherson, Sir Lowry Road.
Liba, No. 2580	French Arab. Thoroughbred	Thoroughbred Arab	Stallion	France	Bellingham Bros., Glenconnor, C.P.
Fairview Johanna Colantha	Holstein-Friesian, Vol. 30	Holstein-Friesian.	Bull	America	H. Hosking, Nelsrust, Natal.
South Count, No. 744	English, Vol. XXI	—	—	U.K.	A. Meikle, Johannesburg.
Blue Ribbon, No. 742	English, Vol. XXII	—	Colt	U.K.	A. Meikle, Johannesburg.
Unnamed, No. 743	English. Vol. XXI	—	Filly	U.K.	A. Meikle. Johannesburg.
Unnamed, No. 777	English, Vol. XXII	—	Mare	U.K.	A. Meikle, Johannesburg.
Margrave Bery, No. 27402	Shire Horse Society	—	Stallion	U.K.	G. E. Blaker, Estcourt, Natal.
Unknown	—	Merino	Ram	Tasmania	E. J. van Rooyen, Greytown. Natal.
Unknown	—	Merino	Ram	Tasmania	E. J. van Rooyen, Greytown, Natal.
Unknown	—	Unknown	Ram	N. S. Wales	F. E. Frost, Cyphergat, C.P.

In addition to the foregoing there were imported the following :—

Through East London.—31 Australian rams, 50 Australian ewes.

Through Durban.—16 rams, 73 ewes, 14 bulls, 9 heifers, and 3 calves (all from Australia); 1 ram (New Zealand); 2 stallions (England); 1 stallion (U.S.A.); 5 mares (England); 1 filly (England); 3 colts (England); 1 gelding (England).

Through Capetown.—1 gelding, 1 stallion. and 1 filly (all from England); 1 stallion (France).

Export of Fresh Fruit.

Statement showing the description and declared value of fresh fruit exported from the Union of South Africa during the month ended 31st December, 1911, distinguishing ports of shipment.

Description	Via Capetown.	Via Port Elizabeth.	Via East London.	Via Natal.	Via Delagoa Bay.	Via Other Routes.	Total.
	£	£	£	£	£	£	£
Apples	19	—	—	—	—	—	19
Apricots.........	340	—		—	125	—	465
Bananas.........	52	—	—	—	—	1	53
Grapes	—	—	—	1	3	—	4
Lemons	2	—	—	—	11	—	13
Naartjes.........	—	11	—	—	10	—	21
Oranges	90	24	—	—	85	1	200
Peaches	1,502	—	—	—	46	—	1,548
Pears	6	—	—	—	—	—	6
Pines	28	15	—	6	2	2	53
Plums	58	—	—	—	26	2	86
Nuts.............	11	—	—	—	—	—	11
All Other........	102	—	2	—	24	—	128
Total......£	2,210	50	2	7	332	6	2,607

Agricultural Show Dates, 1912.

CAPE PROVINCE.

Robertson.—Tuesday and Wednesday, 13th and 14th February.
Queenstown.—Tuesday and Wednesday, 20th and 21st February.
Riversdale.—Wednesday, 21st February.
Malmesbury —Thursday, 22nd February.
Beaufort West. -Thursday, 22nd February.
Rosebank.—Tuesday, Wednesday, Thursday, and Friday, 27th, 28th, 29th February, and 1st March.
Cathcart.—Wednesday, 28th February.
Graaff-Reinet.—Tuesday and Wednesday, 5th and 6th March.
Caledon.—Thursday and Friday, 7th and 8th March.
Middelburg.—Thursday, Friday, and Saturday, 7th 8th, and 9th March.
East London.—Tuesday and Wednesday, 12th and 13th March.
Cradock.—Tuesday and Wednesday, 12th and 13th March
Bredasdorp.—Wednesday, 13th March.
George.—Wednesday, 13th March.
Bathurst.—Wednesday and Thursday, 13th and 14th March.
Oudtshoorn.—Wednesday and Thursday, 13th and 14th March.
Molteno.—Wednesday and Thurday, 13th and 14th March.
Britstown.- Friday, 15th March.
Somerset East.—Friday and Saturday, 15th and 16th March.
Aliwal North. - Tuesday and Wednesday, 19th and 20th March.
Humansdorp.—Thursday and Friday, 21st and 22nd March.
Grahamstown.—Thursday and Friday, 21st and 22nd March.
Barkly East.—Friday and Saturday, 22nd and 23rd March
Port Elizabeth. -Tuesday, Wednesday, Thursday, and Friday, 26th to 29th March.

NATAL PROVINCE.

Newcastle.—Thursday and Friday, 6th and 7th June.
Vryheid – Tuesday and Wednesday, 11th and 12th June.
Dundee.—Thursday and Friday, 13th and 14th June.
Klip River (Ladysmith).—Tuesday and Wednesday, 18th and 19th June.
Weenen (Estcourt).—Thursday and Friday, 20th and 21st June.
Umvoti (Greytown).—Thursday and Friday, 20th and 21st June.
Lion's River.—Tuesday, 25th June.
Maritzburg. Thursday, Friday, and Saturday, 27th, 28th, and 29th June.
Durban.—Wednesday, Thursday, and Friday, 3rd, 4th, and 5th July.
Lower Umzimkulu (Port Shepstone).—Tuesday, 9th July.
Camperdown.—Thursday, 11th July.
New Hanover.—Wednesday, 24th July.
Richmond.—Unfixed.
Alexandra County (Umzinto).—Unfixed.
Ixopo.—Unfixed.
Noodsberg Road.—Unfixed.

TRANSVAAL PROVINCE.

Bronkhorstspruit.—Wednesday, 14th February.
Bethal.—Thursday, 22nd February.
Lydenburg.—March (date not fixed).
Wakkerstroom (Amersfoort Branch).—Thursday, 28th February.
Wakkerstroom (Wakkerstroom Branch).—Wednesday, 6th March.
Wakkerstroom (Volksrust Branch).—Wednesday and Thursday, 13th and 14th March.
Heidelberg. - Wednesday and Thursday, 27th and 28th March.
Standerton —Tuesday and Wednesday, 2nd and 3rd April.
Pretoria.—Tuesday, Wednesday, and Thursday, 2nd, 3rd, and 4th April.
Johannesburg (Witwatersrand). — Wednesday, Thursday, Friday, and Saturday, 10th, 11th, 12th, and 13th April.
Wolmaransstad.—Wednesday, 15th May.

ORANGE FREE STATE PROVINCE.

Smithfield.—Wednesday and Thursday, 14th and 15th February.
Ladybrand.—Wednesday and Thursday, 21st and 22nd February.
Edenburg.—Wednesday and Thursday, 28th and 29th February.
Rouxville.—Wednesday and Thursday, 28th and 29th February.
Wepener.—Wednesday and Thursday, 6th and 7th March.
Bethulie.—Wednesday and Thursday, 6th and 7th March.
Harrismith.—Wednesday and Thursday, 6th and 7th March.
Lindley.—Thursday, 7th March.
Thaba 'Nchu.—Tuesday and Wednesday, 12th and 13th March.
Fauresmith and Jagersfontein.—Wednesday and Thursday, 13th and 14th March.
Senekal.—Wednesday and Thursday, 13th and 14th March.
Vrede.—Wednesday and Thursday, 13th and 14th March.
Bethlehem.—Wednesday and Thursday, 20th and 21st March.
Boshof.—Wednesday and Thursday, 20th and 21st March.
Kroonstad.—Tuesday and Wednesday, 26th and 27th March.
Ficksburg.—Tuesday and Wednesday, 26th and 27th March.
Heilbron.—Wednesday and Thursday, 27th and 28th March.
Philippolis.—Thursday, 28th March.
Winburg.—Wednesday and Thursday, 3rd and 4th April.
Frankfort.—Tuesday and Wednesday, 9th and 10th April.
Clocolan and Marquard.—Wednesday, 10th April.
Bloemfontein.—Tuesday, Wednesday, and Thursday, 16th, 17th, and 18th April.

Farm Employment.

Applicant seeks managership of farm. Life experience in lucerne cultivation, ostrich, sheep, and cattle farming, and agriculture. Has managed farms in Cape Province, Orange Free State, and Transvaal. Married. Testimonials.—GEO. J. HITGE, Greystones Farm, P.O. Val Station, District Standerton, Transvaal. [11]

A young man, strong and healthy, 17 years of age, seeks employment on a large progressive farm as an improver with a view of getting a sound practical knowledge of farming. Advertiser speaks both English and Dutch, and has had practical experience as a farm hand for six months.—Apply FARMER, P.O. Box 87, Pretoria. [12]

Young man, 25 years of age, seeks employment as foreman or general working man on a farm. Sober, strong, healthy, not afraid of work. Knowledge of mixed farming; testimonials. Speaks Dutch and English.—G. J. ROSSOUW, c/o H. Vaughan-Williams, Driefontein, Clocolan, O.F.S. [1]

Young man seeks employment on farm with a view to learning farming. Speaks English and Dutch.—V. HAUTEKIET, Nieuport, Bams, Belgium. [2]

Departmental Notices.

EXPERIMENTAL FARM, POTCHEFSTROOM.

SEEDS FOR DISPOSAL.

Wheat. —Price 12s. 6d. per 100 lb. delivered at buyer's station.

Early and medium early varieties suitable for irrigated land.— Wit Klein Koren; Rooi Wol Koren; Spring; Glujas Early; Eckstein; Bombay; Medeah; Fourie; Australian; Egyptian Red; and Hawkesbury.

Late Varieties.—Red Fife; Standerton Winter.

Rye—" Early "—Price 12s. 6d. per 100 lb., delivered at buyer's station.

This variety is recommended for green forage purposes.

All the above prices are subject to alteration without notice.

These seeds consist of different varieties which have been experimented upon at this farm, and have proved valuable; the crops thereof have been specially grown for seed purposes.

Applications for these seeds should be made on or before the 1st March. No " orders " will be booked until that date, but applications may then be closed, and the available supply distributed *pro rata* among the different applicants. In that case only orders which are then definitely placed will be considered; an inquiry which is still the subject of correspondence will not be considered a definite order.

Orders must be accompanied by remittance, and cheques and money orders should be drawn in favour of the General Manager, Experimental Farm, Potchefstroom, from whom any further particulars can be obtained.

ALEX. HOLM,
General Manager.

24th January, 1912.

The Agricultural Journal

OF THE UNION OF SOUTH AFRICA.

Vol. III. MARCH, 1912. No. 3.

Issued MONTHLY in English and Dutch by the Department of Agriculture.

Communications to be addressed to the Editor, Department of Agriculture, Box 434, Pretoria. Telegraphic Address. "Bulletin, Pretoria."

Subscriptions should be posted to the Government Printer, Box 373, Pretoria.

Advertising inquiries should be addressed to the Metropolitan Advertising Co., Box 962, Capetown.

Experiments to Determine the Safe Dose of White Arsenic, Cooper's Dip, and Bluestone for Sheep.

By Dr. ARNOLD THEILER, C.M.G., Acting Director of Veterinary Research.

THE drugs mentioned in the title of this paper are frequently used in South Africa for the treatment of many diseases in all classes of domesticated stock, both with the object of prevention and of cure. These drugs are, however, more particularly in vogue for the treatment of sheep affected both with wire-worms and tape-worms. In addition, Cooper's Dip is widely known, and has a well-established reputation as a preventive for geilziekte.

On looking through the South African literature the writer has noticed that the toxicology of these various drugs has never been properly worked up, and no reliable data are to be obtained as to the maximal and minimal doses of any of these drugs.

Taking these facts into consideration, and knowing that the drugs are undoubtedly effective in the treatment of sheep for wire-worms, either separately or jointly, the writer was induced to undertake an unusually large series of experiments on sheep, with the object of arriving at the maximal reliable dose of these drugs, and of the mixtures which come into consideration. These investigations were undertaken with the powdered drugs, as experience has proved that even with extreme care the administration of the liquid bluestone, etc., to sheep occasionally leads to accidents, owing to the solution passing into the lungs. The use of the powdered form excludes the possibility of similar misfortunes.

At the same time it was thought it would be advantageous for the farmer to have some information about the post-mortem lesions caused by an overdose of these medicines, and therefore a minute description

is given in the appendix, detailing what was found in the sheep which were poisoned by any of these drugs.

THE DRUGS.

(1) White arsenic or arsenious oxide is a remedy of old standing. It is a whitish powder and has a rather high specific gravity. It dissolves slowly in cold water in the proportion of one part of arsenic in sixty parts of cold water, but it is easily soluble in alkaline and acid solutions.

(2) Cooper's Dip is a proprietary drug, the composition of which has, to the writer's knowledge, never been published by the manufacturer. Its chief constituents are, however, arsenic combined with sulphur and alkalies. According to Dr. Juritz the arsenic is probably present in the form of soluble compounds, such as sodium arsenite and sulph-arsenite.

(3) The chemical name for bluestone is sulphate of copper, and is recognized by the large transparent blue crystals, which are easily soluble in cold water. After exposure to the dry atmosphere the crystals dessicate, and appear to be covered with a white powder.

When ordering bluestone for medicinal purposes, it should be asked for by its chemical name, "sulphate of copper", and, before using, it should be properly examined.

When the writer was ordering bluestone from wholesale firms it happened that quite a different article was supplied, viz., sulphate of iron, and, when asked for an explanation, the suppliers stated that this drug commercially goes under the name of "bluestone".

Sulphate of iron is distinguishable by the greenish crystals, but many samples of sulphate of copper contain a considerable quantity of iron sulphate. Such material should always be rejected.

Measuring the Drugs.

The farmer goes by all sorts of measures, his favourite being the tea and table spoon. He rarely uses the proper one, viz., weight, and a reference to Plate No. I will clearly demonstrate the fallacy of relying on spoons to give him a correct weight. The spoons shown in the plate were bought at random from different firms in Pretoria, and, on comparing the quantities they hold, it will be seen that it is possible for an error of 20 grains to occur, a matter of vital importance when this quantity of Coop r's Dip or bluestone, over and above the proper dose, would be fatal for sheep.

The writer would strongly advise the farmer to weigh out the quantities contained in his tea and table spoons by means of scale and weights (avoirdupois). The cost of the scale hardly amounts to the value of a sheep, and by saving one sheep by proper dosing his outlay on the scales is amply repaid.

All the following experiments were undertaken with weighed-out quantities, the unit of weight being the metric gramme (1 gramme = 15 grains). As this measure is, however, not in common use in South Africa, the weights have all been converted to grains, ounces, and pounds (avoirdupois). The following is the scale of weights to be adopted by the farmer in weighing out any of the materials referred to.

Safe Dose of White Arsenic, etc., for Sheep.

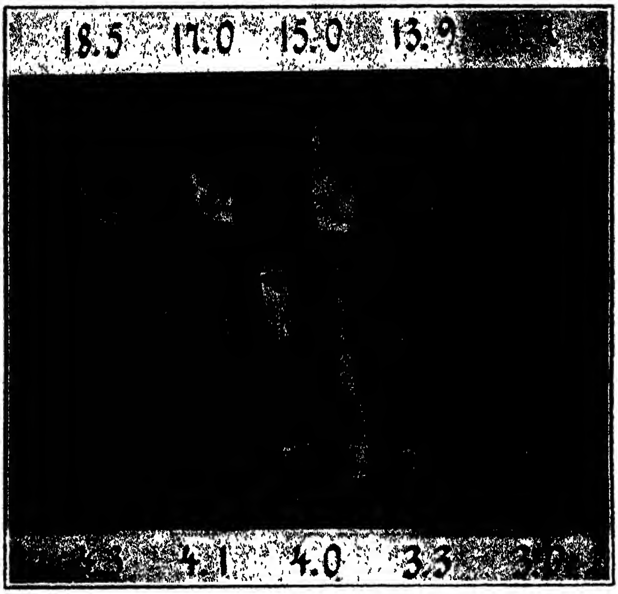


Plate No. 1 showing the difference in size and capacity of various tea and table spoons

(Note. - The figures refer to the amount of Bluestone, in grammes, held by the different spoons.)

Tablespoons.			*Teaspoons.*		
18·5 grammes	=	277½ grains	4·3 grammes	=	64½ grains.
17·0	,,	255 ,,	4·1	,, =	61½ ,,
15·0	,,	225 ,,	4·0	,,	60 ,,
13·9	,,	208½ ,,	3·3	,, =	4[illegible]½ ,,
11·7	,, =	175½	3·0	,, =	45 ,,

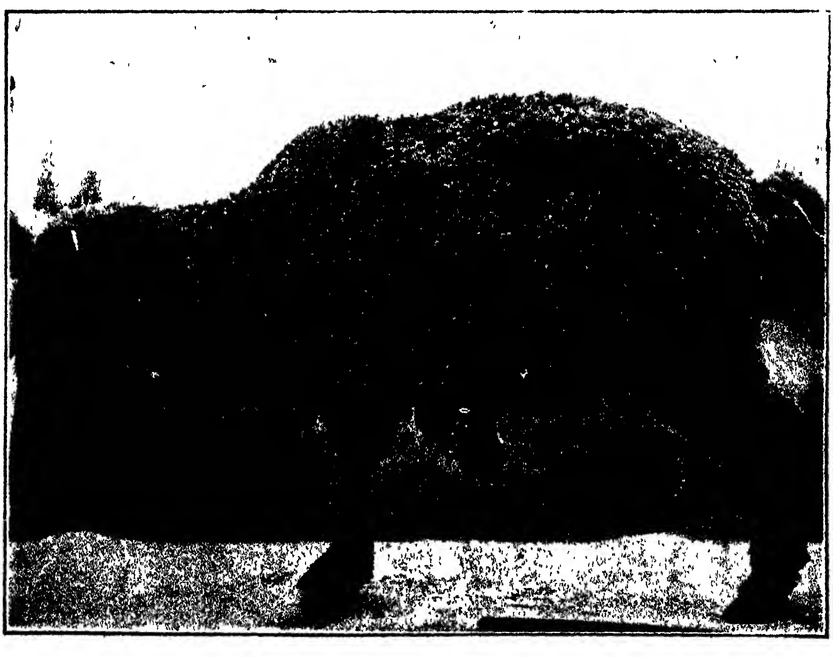


Plate No. 2. Prolapsis of the stomach due to poisoning with Bluestone and Arsenic.

Avoirdupois Weight.

437½ grains = 1 oz.
16 oz. = 1 lb. (or 7000 grains).

Note.—The drachm weight has been omitted in order to prevent confusion between the "apothecaries" and the "avoirdupois" weights.

AGE AND WEIGHT OF THE EXPERIMENTAL SHEEP.

The sheep referred to in the following experiments were of all ages, although there was a preponderance of 2-tooth and full-mouth sheep compared with the 4 and 6 tooth animals.

Roughly speaking, for each 4-tooth sheep there were two 2-tooth, one 6-tooth, and two full-mouth sheep.

Their weights varied from 35 to 80 lb., the average being 60 lb.

PART I.—EXPERIMENTS WITH WHITE ARSENIC.

EXPERIMENT No. 1.—TO FIND THE FATAL DOSE OF WHITE ARSENIC FOR SHEEP.

Experiment.—Sixteen sheep received varying doses of arsenic, the results being as follows:—

Weight.............	7½	15	30	45	60	75	90	105	120	135	150	grains.
No. of sheep dosed...	2	3	3	1	1	1	1	1	1	1	1	
No. of sheep that died	0	0	0	0	0	0	0	0	0	0	0	

Conclusion.—The remarkable and almost incredible fact is noticed that, in this experiment, none of the dosed sheep died; the extraordinarily high dose of 150 grains of white arsenic had no ill effect. This experience led to the supposition that the drug used in the experiments was not pure arsenious oxide. A sample was, therefore, submitted to the Chemical Analyst, who, after analysis, pronounced it to be pure white arsenic, and all doubts were accordingly removed.

EXPERIMENT No. 2.—TO FIND THE OPTIMAL DOSE OF ARSENIC FOR A NUMBER OF SHEEP, VIZ., THE DOSE WHICH CAN BE GIVEN WITHOUT THE RISK OF POISONING THEM.

Note.—Since the watering of sheep previous to and after dosing is of considerable importance in the effect of the drug, the experiment was carried out in two sections.

I.—Dose of 15 *grains of White Arsenic.*

(*A*) Sheep watered twenty-eight hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were treated on the 6th June, 1911.
Result.—No ill effects and no deaths occurred.

(*B*) Sheep watered twenty-eight hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were treated on the 15th June, 1911.

Result.—No ill effects and no deaths resulted.

II.—Dose of 30 *grains of White Arsenic.*

(*A*) Sheep watered twenty-eight hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were treated on the 6th June, 1911.

Result.—No ill effects and no deaths occurred.

(*B*) Sheep watered twenty-eight hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were dosed on the 6th June, 1911.

Result.—No ill effects and no deaths followed.

III.—Dose of 45 *grains of White Arsenic.*

(*A*) Sheep watered twenty-eight hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were treated on the 6th June.

Result.—No ill effects and no deaths ensued.

(*B*) Sheep watered twenty-eight hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were treated on the 6th June, 1911.

Result.—No ill effects and no deaths followed.

IV.—Dose of 60 *grains of White Arsenic.*

(*A*) Sheep watered twenty-eight hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were treated.

Result.—Two sheep died; one on the 7th, and the other on the 11th day.

The death of these two animals was due to peritonitis (*vide* post-mortem report under "Arsenious Oxide Poisoning"—page 346).

(*B*) Sheep watered twenty-eight hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were dosed on the 6th June, 1911.

Result.—No ill effects and no deaths occurred.

Summary of Results.

Arsenic in the dose of 15, 30, and 45 grains had no ill effect on ninety sheep, either when they were watered twenty-four hours after dosing or when they were watered immediately after dosing.

In the dose of 60 grains, arsenic caused the death of two sheep of the lot of fifteen which were watered immediately after dosing, but no ill effects were noted in the batch that were watered twenty-four hours after dosing.

Conclusions.—It appears that arsenious oxide in the dose of 15, 30, and 45 grains is a safe dose for sheep, but it would not be wise to use the largest dose on a great number of sheep.

PART II.—EXPERIMENTS WITH COOPER'S DIP.

EXPERIMENT No. 3.—TO FIND THE FATAL DOSE OF COOPER'S DIP FOR SHEEP.

Experiment.—Eleven sheep received varying doses of Cooper's Dip, the results being as follows :—

Weight of Cooper's Dip........	15	30	45	$67\frac{1}{2}$	135	180	grains.
No. of sheep dosed	2	2	2	3	1	1	
No. of sheep that died.........	0	0	0	1	1	1	

Conclusion.—Cooper's Dip killed the two sheep which received the extraordinarily large dose of 135 and 180 grains, the cause of death being gastro-enteritis. Of the three sheep which were dosed with $67\frac{1}{2}$ grains, one died twenty-two days after the administration of the drug from gastro-enteritis.

The safe dose would, therefore, appear to be below $67\frac{1}{2}$ grains.

EXPERIMENT No. 4.—TO FIND THE MAXIMAL DOSE OF COOPER'S DIP WHICH CAN BE GIVEN WITH SAFETY TO A NUMBER OF SHEEP.

I.—Dose : 15 *grains of Cooper's Dip.*

(*A*) *Note.*—The sheep were watered twenty-four hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were dosed on the 21st April, 1911.

Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-four hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were dosed on the 21st April, 1911.

Result.—No ill effects were noted.

II.—Dose : 30 *grains of Cooper's Dip.*

(*A*) *Note.*—The sheep were dosed six hours after watering and feeding. They were fed again one hour after dosing and watered fifteen hours later.

Experiment.—Ten sheep were dosed on the 10th March, 1911.

Result.—One sheep died of gastro-enteritis the following day.

Experiment.—Eight sheep were dosed on the 22nd March, 1911.

Result.—No ill effects resulted.

(*B*) *Note.*—The sheep were watered twenty-four hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were dosed on the 21st April, 1911.

Result.—No ill effects were noted.

(*C*) *Note.*—The sheep were watered twenty-four hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were dosed on the 21st April, 1911.

Result.—On the 22nd April none of the sheep were feeding; on the 23rd a few were feeding.

III.—Dose: 45 grains of Cooper's Dip.

(*A*) *Note.*—The sheep were watered twenty-four hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were dosed on the 21st April, 1911.

Result.—One sheep died within twenty-four hours, and one died after twenty-four hours—both from gastro-enteritis.

(*B*) *Note.*—The sheep were watered twenty-four hours previous to dosing and twenty-four hours later.

Experiment.—Fifteen sheep were dosed on the 21st April 1911.

Result.—One sheep died on the 7th day, and one sheep died on the 8th day—both from gastro-enteritis.

The sheep of this lot refused to feed during the two days succeeding dosing, and several showed a discharge from the nostrils.

IV.—Dose: 60 grains of Cooper's Dip.

(*A*) *Note.*—The sheep were watered twenty-four hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were dosed on the 21st April, 1911.

Result.—Eleven sheep died within twenty-four hours, two sheep died after twenty-four hours, and one died on the 4th day—all from gastro-enteritis.

(*B*) *Note.*—The sheep were watered twenty-four hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were dosed on the 21st March, 1911.

Result.—Four sheep died within twenty-four hours, one died after twenty-four hours, and one died on the 4th day—all from gastro-enteritis.

Note.—The survivors of both lots were not feeding well for some days, and all showed a mucous discharge from the nostrils.

Summary of Results.

(1) Cooper's Dip administered to sheep in the doses of 15 grains had no fatal effect on thirty sheep. The fifteen sheep belonging to the lot of "watered twenty-four hours previous to and after dosing" were noticed to be "off feed" the day following.

(2) With the dose of 30 grains, forty-eight sheep were dosed, and one died the following day.

(3) With the doses of 45 grains, thirty sheep were dosed, and four died. Two of the sheep died within forty-eight hours. They belonged to the lot "watered immediately after dosing". Two died on the 7th and 8th days respectively; these latter were watered twenty-four hours after dosing.

(4) With the dose of 60 grains, thirty sheep were treated, and of these fourteen out of fifteen of the lot which were "watered immediately after dosing" died, death taking place, with one exception, within forty-eight hours. Of the lot "watered twenty-four hours after dosing" six died, and, with one exception, death took place within forty-eight hours.

Conclusions.

It appears to be safe to give Cooper's Dip in the dose of 15 grains to sheep either when they are watered or not watered after dosing.

A mortality of 2·1 per cent. occurred in sheep which were dosed with 30 grains; about 25 per cent. of the sheep showed symptoms of disturbance by refusing to feed.

A mortality of 13 per cent. occurred in sheep which were dosed with 45 grains, and the survivors showed distinct symptoms of illness.

A remarkable fact is noted here, that the sheep watered immediately after dosing died within twenty-four hours; those watered after twenty-four hours died only seven and eight days later.

Amongst the sheep dosed with 60 grains, the greatest mortality (93 per cent.) occurred amongst the lot watered immediately after dosing, and a smaller mortality (40 per cent.) was noted in the lot which were watered twenty-four hours after.

The dose of Cooper's Dip which can be given with safety appears to be 15 grains.

PART III.—EXPERIMENTS WITH BLUESTONE.

EXPERIMENT No. 5.—TO FIND THE MAXIMAL DOSE OF BLUESTONE WHICH CAN BE GIVEN WITH SAFETY TO A NUMBER OF SHEEP.

Dose: 22½ grains Bluestone.

(*A*) *Note.*—The sheep were watered twenty-eight hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were dosed on the 18th May, 1911.

Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-eight hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were dosed on the 18th May, 1911.

Result.—No ill effects were noted.

Dose: 45 grains Bluestone.

(*A*) *Note.*—The sheep were watered twenty-eight hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were dosed on the 18th May, 1911.

Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-eight hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were treated on the 18th May, 1911.

Result.—Two sheep died within twenty-four hours, and one sheep died on the 5th day—all from gastro-enteritis.

Dose: 67½ grains Bluestone.

(*A*) *Note.*—The sheep were watered twenty-eight hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were dosed on the 18th May, 1911.

Result.—One sheep died within twenty-four hours, one died after thirty-six hours, and one after forty-eight hours—all from gastro-enteritis.

(*B*) *Note.*—The sheep were watered twenty-eight hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were dosed on the 18th May, 1911.

Result.—Three sheep died within twenty-four hours from gastro-enteritis.

Dose : 90 grains Bluestone.

(*A*) *Note.*—The sheep were watered twenty-eight hours previous to and immediately after dosing.

Experiment.—Fifteen sheep were dosed on the 18th May, 1911.

Result.—Six sheep died within twenty-four hours, and two died after thirty-six hours—all from gastro-enteritis.

(*B*) *Note.*—The sheep were watered twenty-eight hours previous to and twenty-four hours after dosing.

Experiment.—Fifteen sheep were dosed on the 18th May, 1911.

Result.—Six sheep died within twenty-four hours, and one after thirty-six hours—all from gastro-enteritis.

Summary of Results.

(1) Of thirty sheep dosed with 22½ grains of bluestone none died.

(2) Of thirty sheep dosed with 45 grains of bluestone three died of the lot "watered twenty-four hours after dosing".

(3) Of thirty sheep dosed with 67½ grains six sheep died—three of each lot.

(4) Of thirty sheep dosed with 90 grains bluestone fifteen died, of which eight belonged to the first, and seven to the second lot.

Conclusions.

The dose of 22 grains bluestone appears to represent a safe dose for sheep; it may probably be slightly increased.

The dose of 45 grains and more may cause death.

It seems to be immaterial whether the animals are watered directly after dosing, or only twenty-four hours later.

PART IV.—EXPERIMENTS WITH A MIXTURE OF BLUESTONE AND WHITE ARSENIC.

It having been found that white arsenic may apparently be given in the dose of 15, 30, and 45 grains, and a safe dose of bluestone may be slightly above 22½ grains, it was decided to experiment with a combination of the two optimal doses.

EXPERIMENT NO. 1.—TO FIND THE MAXIMAL DOSE OF A MIXTURE OF BLUESTONE AND WHITE ARSENIC THAT CAN BE GIVEN WITH SAFETY TO A NUMBER OF SHEEP.

Dose: 15 *grains of White Arsenic and* 15 *grains of Bluestone.*

(*A*) *Note.*—The sheep were watered directly after dosing.
Experiment.—Twenty sheep were dosed on the 5th July, 1911.
Result.—No ill effects resulted.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Twenty sheep were dosed on the 5th July, 1911.
Result.—No ill effects were noted.

Summary of Results.—Of forty sheep dosed with a mixture of 15 grains of white arsenic and 15 grains of bluestone, none died.

Conclusion.—The dose of 15 grains of white arsenic, mixed with 15 grains of bluestone, seems to be a safe dose for sheep.

Dose: 30 *grains of White Arsenic and* 15 *grains of Bluestone.*

(*A*) *Note.*—The sheep were watered directly after dosing.
Experiment.—Twenty sheep were dosed on the 5th July, 1911.
Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Twenty sheep were dosed on the 5th July, 1911.
Result.—One sheep died three days after dosing from gastro-enteritis.

Summary of Results.—The mixture of 30 grains of white arsenic and 15 grains of bluestone caused the death of one sheep out of forty (2·5 per cent.)

Conclusion.—The dose of 30 grains of white arsenic and 15 grains of bluestone does not appear to be a safe dose for sheep.

Dose: 30 *grains Bluestone and* 30 *grains White Arsenic.*

(*A*) *Note.*—The sheep were watered immediately after dosing.
Experiment.—Three sheep were dosed on the 13th June, 1911.
Result.—One sheep was killed on 12th July, 1911, owing to a prolapsis of the stomach.
Experiment.—Fifteen sheep were dosed on the 16th June, 1911.
Result.—No ill effects were noted.
Experiment.—Fifteen sheep were dosed on the 29th June, 1911.
Result.—One sheep died after thirty-six hours from gastro-enteritis, and two sheep were killed on the 4th and 5th of August, 1911, respectively, owing to a prolapsis of the stomach.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Three sheep were dosed on the 13th June, 1911.
Result.—No ill effects resulted.
Experiment.—Fifteen sheep were dosed on the 16th June, 1911.
Result.—No ill effects were noted.
Experiment.—Fifteen sheep were dosed on the 29th June, 1911.
Result.—One sheep was slaughtered on the 22nd July, 1911, and one on the 17th August, 1911—both on account of prolapsis of the stomach.

Summary of Results.—Of sixty-six sheep dosed with a mixture of 30 grains of white arsenic, added to 30 grains of bluestone, five were

killed owing to a prolapsis of the stomach (75 per cent.), and one died of gastro-enteritis.

Conclusion.—The dose of 30 grains of white arsenic, mixed with 30 grains of bluestone, does not appear to be a safe dose for sheep.

PART V.—EXPERIMENTS WITH BLUESTONE AND COOPER'S DIP.

EXPERIMENT No. 7.—TO FIND THE MAXIMAL DOSE OF A MIXTURE OF BLUESTONE AND COOPER'S DIP WHICH WILL NOT CAUSE DEATH.

Dose: 15 grains of Bluestone and 15 grains of Cooper's Dip.

(*A*) *Note.*—The sheep were watered directly after dosing.
Experiment.—Three sheep were dosed on the 16th June, 1911.
Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Three sheep were dosed on the 16th June, 1911.
Result.—No ill effects were noted.

Conclusion.—The dose of 15 grains of Cooper's Dip, added to 15 grains of bluestone, seems to be a safe dose for sheep.

Dose: 22½ grains of Bluestone and 15 grains of Cooper's Dip.

(*A*) *Note.*—The sheep were watered directly after dosing.
Experiment.—Three sheep were dosed on the 16th June, 1911.
Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Three sheep were dosed on the 16th June, 1911.
Result.—No ill effects were noted.

Conclusion.—The dose of 22½ grains of bluestone, added to 15 grains of Cooper's Dip, seems to be a safe dose for a sheep.

Dose: 22½ grains of Bluestone and 22½ grains of Cooper's Dip.

(*A*) *Note.*—The sheep were watered directly after dosing.
Experiment.—Three sheep were dosed on the 16th June, 1911.
Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Three sheep were dosed.
Result.—No ill effects followed.

Conclusion.—The dose of 22½ grains bluestone, added to 22½ grains Cooper's Dip, seems to be a safe dose for a sheep.

Dose: 30 grains of Bluestone and 15 grains of Cooper's Dip.

(*A*) *Note.*—The sheep were watered directly after dosing.
Experiment.—Three sheep were dosed on the 16th June, 1911.
Result.—No ill effects followed.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Three sheep were dosed on the 16th June, 1911.

Result.—One of the sheep died twenty-four hours after dosing of gastro-enteritis.

Conclusion.—The dose of 30 grains of bluestone, added to 15 grains of Cooper's Dip, does not appear to be a safe dose for a sheep.

Dose: 30 grains of Bluestone and 30 grains of Cooper's Dip.

(*A*) *Note.*—The sheep were watered directly after dosing.
Experiment.—Three sheep were dosed on the 13th June, 1911.
Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Three sheep were dosed on the 13th June, 1911.
Result.—One sheep died twenty-four hours after from gastro-enteritis.
Conclusion.—The dose of 30 grains of bluestone and 30 grains of Cooper's Dip does not appear to be a safe dose for sheep.

EXPERIMENT No. 8.—TO TEST THE APPARENTLY SAFE DOSE OF COOPER'S DIP AND BLUESTONE ON A NUMBER OF SHEEP.

Dose: 15 grains of Bluestone and 15 grains of Cooper's Dip.

(*A*) *Note.*—The sheep were watered immediately after dosing.
Experiment.—Fifteen sheep were dosed on the 29th June, 1911.
Result.—No ill effects were noted.
Experiment.—Twenty sheep were dosed on the 5th July, 1911.
Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Fifteen sheep were dosed on the 29th June, 1911.
Result.—No ill effects were noted.
Experiment.—Twenty sheep were dosed on the 5th July, 1911.
Result.—No ill effects were noted.

(*C*) *Note.*—The sheep were kept under usual conditions, watered and fed, irrespective of treatment.
Experiment.—Twenty-one sheep were dosed on the 25th October, 1911.
Result.—No ill effects were noted.
Experiment.—Fifty sheep were dosed on the 31st October.
Result.—One sheep died, but the post-mortem did not reveal any gastro-enteritis, and, accordingly, the death has to be considered of an accidental nature.

Dose: 22½ grains of Bluestone and 22½ grains of Cooper's Dip.

(*A*) *Note.*—The sheep were watered immediately after dosing.
Experiment.—Fifteen sheep were dosed on the 29th June, 1911.
Result.—No ill effects were noted.

(*B*) *Note.*—The sheep were watered twenty-four hours after dosing.
Experiment.—Fifteen sheep were dosed on the 29th June, 1911.
Result.—One sheep died thirty-six hours after dosing from gastro-enteritis.

Summary of Results (Experiments Nos. 7 and 8).

(1) One hundred and forty-seven sheep were dosed with 15 grains of bluestone and 15 grains of Cooper's Dip, and none died of the effect of

this dose. One of the experimental sheep succumbed after dosing from accidental causes.

(2) Six sheep were dosed with 22½ grains of bluestone and 15 grains of Cooper's Dip and none died.

(3) Thirty-six sheep were dosed with 22½ grains of bluestone and 22½ grains of Cooper's Dip, and one sheep died of the effects of this dose.

(4) Six sheep were dosed with 30 grains of bluestone and 30 grains of Cooper's Dip, and one died from the effect of the dose.

Conclusion.—The dose of 15 grains of Cooper's Dip, added to 15 grains of bluestone, given in a mixture, seems to be a safe dose for a sheep.

PART VI.—EXPERIMENTS WITH BLUESTONE, COOPER'S DIP, SALT, AND SULPHUR.

EXPERIMENT No. 9.—TO SEE WHETHER AN ADDITION OF COMMON SALT AND SULPHUR CAN BE MADE TO THE SAFE DOSE OF BLUESTONE AND COOPER'S DIP WITHOUT INCREASING THE TOXICITY OF THE MIXTURE.

Note.—This addition was chiefly made to increase the bulk of the mixture with what appears to be harmless substances in order to arrive at a convenient measure in dosing the sheep.

Mixture to contain—

1 part of Cooper's Dip;
1 part of bluestone;
1 part of sulphur;
1 part of common salt.

The dose of the mixture per sheep was calculated to be 45 to 60 grains; in the first case sheep would get 11¼ grains of bluestone and 11¼ grains of Cooper's Dip, and in the second case 15 grains of Cooper's Dip, and 15 grains of bluestone would be contained in each dose of the mixture.

(A) Dose of 45 grains.

Experiment.—Fifteen sheep were dosed with 45 grains of the mixture on the 18th October, 1911.

Result.—No ill effects were noted.

Experiment.—Fifty sheep were dosed with 45 grains of the mixture on the 31st October, 1911.

Result.—Five sheep died of gastro-enteritis.

(B) Dose of 60 grains.

Experiment.—Twenty sheep were dosed with 60 grains of the mixture on the 12th October, 1911.

Result.—Two sheep died of gastro-enteritis.

Experiment.—Twenty-five sheep were dosed with 60 grains of the mixture on the 25th October, 1911.

Result.—Two sheep died from gastro-enteritis within twenty-four hours.

Experiment.—Forty-three sheep were dosed with 60 grains of the mixture on the 31st October. 1911.

Result.—Twelve sheep died of gastro-enteritis.

Summary of Results.

(1) Sixty-five sheep were dosed with 45 grains of a mixture of Cooper's Dip, bluestone, sulphur, and salt, in equal parts, and of this lot five sheep died from poisoning (or 8 per cent.).

(2) Eighty-eight sheep were dosed with 60 grains of the mixture, and of this lot sixteen sheep died from poisoning (18 per cent.).*

Conclusion.—The addition of the non-poisonous materials, salt and sulphur, in equal parts, to an otherwise safe dose of Cooper's Dip and bluestone, appears to render the mixture dangerous for sheep. Accordingly, in a mixture which contains salt and sulphur, the maximal dose of Cooper's Dip and bluestone cannot be given, and, therefore, when the safe effect both of Cooper's Dip and bluestone is expected, it is not advisable to add any other constituents to this mixture of the two.

PART VII.—EXPERIMENTS WITH LICKS.

TO ASCERTAIN THE SAFE DOSE OF COOPER'S DIP AND BLUESTONE WHICH CAN BE ADDED TO A LICK TO WHICH SHEEP HAVE FREE AND DAILY ACCESS.

These experiments were carried out with a threefold object—

(1) to find the maximal dose of lick which will be eaten by a sheep;

(2) to add to this maximal dose the safe dose of bluestone and Cooper's Dip;

(3) to reduce the maximal dose to an average dose which will be taken without ill effect.

Note.—In order to allow for the possibility of some of the lick being wasted as a result of accidents, a deduction of 20 per cent. has been made from the total quantity consumed in each of the following experiments (Nos. 10, 11, and 12).

EXPERIMENT NO. 10.—TO ASCERTAIN THE MAXIMAL QUANTITY OF A LICK WHICH WILL BE CONSUMED BY A SHEEP.

The lick is composed of :—

Slaked lime............................	= 3 parts.
Sulphur................................	= 3 parts.
Common salt............................	= 30 parts.

Note.—One or more sheep to obtain a dish with 7500 grains (1 lb. 1$\frac{1}{7}$ oz.) of the mixture, the quantity consumed to be obtained by a daily weighing of the quantity left in the dish (see under).

(A) *Sheep kept in a Stable.*

(A)

Experiment.—One sheep to be stabled on the 3rd March, 1911, and to have free access to a lick containin 7500 grains of the mixture (1 lb. 1¼ oz.), the amount to be renewed daily.

Result :—

Date: March, 1911.	Quantity consumed by one sheep.	Remarks.
	Grains.	
4	750	It is possible that some uncontrollable accident occurred in this instance.
5	300	
6	150	
7	Nil	
8	75	
9	150	
10	300	
11	Not fed	
12	Not fed	
13	150	
14	150	
15	Nil	
16	30	
17	75	
18	45	
19	Not fed	
20	30	
21	150	
22	Nil	
23	60	
24	Nil	
25	Not fed	
26	150	
27	30	
	TOTAL 2595	

After allowing for 20 per cent. probable wastage, the total quantity consumed by one sheep in 20 days is 2076 grains.

		Grains.
Average quantity of the lick consumed per sheep in one day	=	$103\frac{4}{5}$
Maximal quantity of the lick consumed per sheep in one day	=	750
Minimal quantity of the lick consumed per sheep in one day	=	30

(B)

Experiment.—Three sheep to be stabled and to have free access to a lick containing 7500 grains of the mixture (1 lb. $1\frac{1}{7}$ oz.)

Result :—

Date : March, 1911.	Quantity consumed by three sheep.	Average quantity consumed by one sheep.
	Grains.	Grains.
4	300	100
5	150	50
6	75	25
7	Nil	Nil
8	75	25
9	150	50
10	150	50
11	Not fed	Not fed
12	Not fed	Not fed
13	75	25
14	225	75
15	45	15
16	90	30
17	Nil	Nil
18	60	20
19	Not fed	Not fed
20	60	20
21	300	100
22	Nil	Nil
23	75	25
24	30	10
25	Not fed	Not fed
26	510	170
27	90	30
	TOTAL 2460	TOTAL 820

After allowing for 20 per cent. probable wastage, the total quantity consumed by three sheep in twenty days is 1968 grains, and by one sheep in twenty days is 656 grains.

		Grains.
Average quantity of the lick consumed per sheep in one day	=	$32\frac{4}{5}$
Maximal quantity of the lick consumed per sheep in one day	=	170
Minimal quantity of the lick consumed per sheep in one day	=	10

(*B*) *Sheep to be kept in a Camp.*

(C)

Experiment.—One sheep to run in a camp, and to have free access to a lick containing 7500 grains of the mixture (1 lb. $1\frac{1}{7}$ oz.)

Result :—

Date : March, 1911.	Quantity consumed by one sheep.
	Grains.
5	Nil
6	Nil
7	Nil
8	Nil
9	Nil
10	Nil
11	Not fed
12	Not fed
13	Nil
14	60
15	60
16	Nil
17	Nil
18	Nil
19	Not fed
20	Nil
21	30
22	105
23	30
24	Nil
25	Not fed
26	Nil
27	Nil
TOTAL	285

After allowing for 20 per cent. probable wastage, the total quantity consumed by one sheep in twenty days is 228 grains.

		Grains.
Average quantity of the lick consumed per sheep in one day	=	$11\frac{2}{5}$
Maximal quantity of the lick consumed per sheep in one day	=	105
Minimal quantity of the lick consumed per sheep in one day	=	30

(D)

Experiment.—Two sheep to run in a camp, and to have fr e access to a lick containing 7500 grains of the mixture (1 lb. 1½ oz.)

Result :—

Date: March, 1911.	Quantity consumed by two sheep.	Average quantity consumed by one sheep.
	Grains.	Grains.
5	300	150
6	Nil	Nil
7	75	37½
8	75	37½
9	Nil	Nil
10	120	60
11	Not fed	Not fed
12	Not fed	Not fed
13	60	30
14	195	97½
15	75	37½
16	60	30
17	165	82½
18	75	37½
19	Not fed	Not fed
20	Nil	Nil
21	Nil	Nil
22	120	60
23	Nil	Nil
24	90	45
25	Not fed	Not fed
26	300	150
27	135	67½
	TOTAL 1845	TOTAL 922½

After allowing for 20 per cent. probable wastage, the total quantity consumed by two sheep in twenty days = 1476 grains, and the average quantity consumed by one sheep in twenty days = 738 grains.

		Grains.
Average quantity of the lick consumed per sheep in one day	=	37
Maximal quantity of the lick consumed per sheep in one day	=	150
Minimal quantity of the lick consumed per sheep in one day	=	30

(E)

Experiment.—Four sheep to run in a camp, and to have free access to a lick containing 7500 grains of the mixture (1 lb. $1\frac{1}{7}$ oz.)

Result :—

Date: March, 1911.	Quantity consumed by four Sheep.	Average quantity consumed by one Sheep.
	Grains.	Grains.
5	450	$112\frac{1}{2}$
6	Nil	Nil.
7	60	15
8	Nil	Nil
9	150	$37\frac{1}{2}$
10	Nil	Nil
11	Not fed	Not fed
12	Not fed	Not fed
13	75	$18\frac{3}{4}$
14	450	$112\frac{1}{2}$
15	450	$112\frac{1}{2}$
16	120	30
17	300	75
18	300	75
19	Not fed	Not fed
20	45	$11\frac{1}{4}$
21	300	75
22	300	75
23	150	$37\frac{1}{2}$
24	150	$37\frac{1}{2}$
25	Not fed	Not fed
26	900	225
27	135	$33\frac{3}{4}$
	TOTAL 4335	TOTAL $1083\frac{3}{4}$

After allowing for 20 per cent. probable wastage, the total quantity consumed by four sheep in twenty days = 3468 grains, and the average quantity consumed by one sheep in twenty days = 867 grains.

		Grains.
Average quantity of the lick consumed per sheep per day	=	$43\frac{1}{3}$
Maximal quantity of the lick consumed per sheep per day	=	225
Minimal quantity of the lick consumed per sheep per day	=	$11\frac{1}{4}$

(F)

Experiment.—Six sheep to run in a camp, and have free access to a lick containing 7500 grains of the mixture (1 lb. 1¼ oz.), the lick to be renewed daily.

Result :—

Date: March, 1911.	Quantity consumed by six sheep.	Quantity consumed by one sheep.
	Grains.	Grains.
5	825	137½
6	Nil	Nil
7	75	12½
8	150	25
9	Nil	Nil
10	150	25
11	Not fed	Not fed
12	Not fed	Not fed
13	60 (One sheep removed on this date.)	12
14	420	84
15	300	60
16	90	18
17	1050	210
18	75	15
19	Not fed	Not fed
20	90	18
21	330	66
22	450	90
23	300	60
24	60	12
25	Not fed	Not fed
26	450	90
27	75	15
		TOTAL 950

After allowing for 20 per cent. probable wastage, the average amount consumed by a sheep in twenty days is 760 grains.

	Grains.
Average quantity of lick consumed by a sheep in one day =	38
Maximal quantity of lick consumed by a sheep in one day =	210
Minimal quantity of lick consumed by a sheep in one day =	12

Summary of Results.

(1) In ascertaining the average amount of lick consumed by a sheep, the question of the "favourite" dose enters into consideration, in distinction to the "mathematical" average.

The following table shows the varying amount consumed by the sheep in the previous experiments :—

Quantity consumed in one day.	Number of times this amount was consumed by individual sheep.
Grains.	
10	1
11¼	1
12	2
12½	1
15	4
18	2
18¾	1
20	2
25	6
30	10
33¾	1
37½	7
45	2
50	3
60	7
66	1
67½	1
75	2
82½	1
84	1
90	2
97½	1
100	2
105	1
112½	3
137½	1
150	8
170	1
210	1
225	1
300	2
750	1

It will thus be seen that of eighty-five "lickings" the amount consumed varied between 10 and 75 grains in fifty-nine instances, or 70 per cent., and in the remaining 30 per cent. of cases quantities between 82 and 750 grains were consumed. The "favourite" dose, therefore, lies between 10 and 75 grains, and a slight preference seems to be shown for an amount varying between 25 and 60 grains.

After making due allowance for probable wastage (20 per cent.) the "favourite" quantity is reduced to about 50 grains.

The "mathematical average", worked out on an average quantity consumed by a sheep, is as follows:—

Part (A)—2595 grains in twenty days.
Part (B)— 820 grains in twenty days.
Part (C)— 285 grains in twenty days.
Part (D)— $922\frac{1}{2}$ grains in twenty days.
Part (E)—$1083\frac{3}{4}$ grains in twenty days.
Part (F)— 950 grains in twenty days.

On a total of $6656\frac{1}{4}$ grains in 120 days, allowing for a probable 20 per cent. wastage, the daily "mathematical" average amount of lick consumed by a sheep would be $44\frac{1}{4}$ grains.

Conclusions.

The main point which comes into consideration is the maximal dose of the lick partaken of by a single sheep. This amounts to 750 grains in a stabled sheep. This highest quantity was, however, only once noticed to have been consumed in a large number of experiments, and it is probable that some accident occurred of which no knowledge was obtained. By omitting to place any reliance on this one instance, the maximal amount consumed can be considered to be 300 grains.

The next point that comes into consideration is the "favourite" dose, and this lays between 25 and 60 grains, with a "mathematical" average of 44 grains.

It can be noticed that the lick is not consumed every day, and that the quantities vary considerably; a larger quantity is usually consumed on the first day. Moreover, stabled sheep appear to consume more than sheep kept in the paddock.

EXPERIMENT NO. 11.—TO ASCERTAIN THE EFFECT OF A LICK WHICH CONTAINS A MIXTURE OF COOPER'S DIP AND BLUESTONE IN (*A*) THE SAFE DOSE CALCULATED ON THE MAXIMAL DOSE OF THE LICK PARTAKEN OF AND (*B*) ON DOUBLE THE SAFE DOSE, ON THE SAME MAXIMUM.

(*A*) *Maximal Dose of Lick* = 750 *grains.*

Safe dose of bluestone 15 grains, and of Cooper's Dip 15 grains.

The safe dose of Cooper's Dip and bluestone appears from Experiment No. 8 to be 15 grains of each, and, accordi g to Experiment No. 10, the maximum amount consumed by a sheep was 750 grains (this representing the extreme maximum). The Cooper's Dip and bluestone combined would, therefore, comprise one-twenty-fifth of the whole mixture.

Experiment.—The lick was made up in the following quantity :—

Bluestone.................	1,125 grains	(2$\frac{4}{7}$ oz.)
Cooper's Dip..............	1,125 grains	(2$\frac{4}{7}$ oz.)
Slaked lime...............	4,500 grains	(10$\frac{2}{7}$ oz.)
Sulphur...................	4,500 grains	(10$\frac{2}{7}$ oz.)
Salt......................	45,000 grains	(6 lb. $\frac{6}{7}$ oz.)
TOTAL..	56,250 grains	(7 lb. 10$\frac{1}{7}$ oz.)

On the 20th July, 1911, 100 sheep were placed in a camp, and on the same day 56,250 grains of a lick as above were placed in a crib in the paddock. The sheep had full access to the lick, and, within two days, the whole quantity was consumed. The lick was immediately renewed, but double the quantity was placed before them. The remains of the lick were removed periodically, and immediately renewed.

The following table shows the complete results of this experiment :—

Date on which the lick was placed before the 100 sheep.	Quantity of lick given.	Date on which the remains were removed.	Quantity of lick removed.	Lick consumed. Quantity.	Lick consumed. Days.	Average amount of lick consumed by one sheep in one day.
1911.	Grains.	1911.	Grains.	Grains.		Grains.
20th July.....	56,250	22nd July...	Nil	56,250	2	281
22nd July....	112,500	27th July....	67,500	45,000	5	90
27th July.....	112,500	3rd August..	7,500	105,000	7	150
3rd August...	112,500	10th August.	4,500	108,000	7	154
10th August..	112,500	18th August.	6,750	105,750	8	132
				420,000 (60 lb.)	29	

The total quantity of lick consumed by one sheep daily in the first two days amounts to 281 grains.

And of this quantity the daily consumption was 5·6 grains bluestone and 5·6 grains Cooper's Dip.

During the whole twenty-nine days the average quantity of lick consumed by one sheep in one day is 144·8 grains, of which 2·9 grains were Cooper's Dip, and 2·9 grains were bluestone.

(*B*) *Double the Safe Dose.*

Maximal dose of the lick = 750 grains: Double the minimal safe dose = 30 grains of bluestone and 30 grains of Cooper's Dip.

Note.—In this experiment the bluestone and Cooper's Dip combined would comprise one-thirteenth of the whole mixture.

Experiment.—The lick was made up in the following quantity :—

Bluestone.................	2,250 grains	(5$\frac{1}{7}$ oz.)
Cooper's Dip..............	2,250 grains	(5$\frac{1}{7}$ oz.)
Slaked lime...............	4,500 grains	(10$\frac{2}{7}$ oz.)
Sulphur...................	4,500 grains	(10$\frac{2}{7}$ oz.)
Salt......................	45,000 grains	(6 lb. 6$\frac{6}{7}$ oz.)
TOTAL............	58,500 grains	(8 lb. 5$\frac{5}{7}$ oz.)

On the 20th July 100 sheep were placed in a camp, and on the same day 58,500 grains of a lick as above were placed in a crib in the paddock. The sheep had full access to the lick, and, within two days, the whole quantity was consumed. The lick was immediately renewed, but double the quantity was placed before them. The remains of the lick were removed periodically, and immediately renewed.

The following table shows the complete results of this experiment:—

Date on which the lick was placed before the 100 sheep.	Quantity of lick given.	Date on which the remains were removed.	Quantity of lick removed.	Lick consumed. Quantity.	Lick consumed. Days.	Average amount of lick consumed by one sheep in one day.
1911.	Grains.	1911.	Grains.	Grains.		Grains.
20th July.....	58,500	22nd July...	Nil	58,500	2	292
22nd July....	117,000	27th July....	45,000	72,000	5	144
27th July.....	117,000	3rd August..	15,300	101,700	7	145
3rd August...	117,000	10th August.	30,000	87,000	7	124
10th August..	117,000	18th August.	15,150	101,850	8	127
				421,050 (60 lb. 2¾ oz.)	29	

The total quantity of lick consumed by one sheep daily in the first two days amounts to 292 grains.

And of this quantity the daily consumption was 11·2 grains bluestone and 11·2 grains Cooper's Dip.

During the whole of the twenty-nine days the average quantity of lick consumed by one sheep in one day is 145·2 grains, of which 5·6 grains were Cooper's Dip, and 5·6 grains were bluestone.

PART VIII.—EXPERIMENTS WITH LAMBS.

EXPERIMENT No. 12.—TO ASCERTAIN THE SAFE DOSE OF COOPER'S DIP AND BLUESTONE FOR LAMBS.

Dose: 7½ grains Cooper's Dip; 7½ grains Bluestone.

Experiment.—On the 10th August, 1911, thirteen lambs, three to six months old, were dosed with a mixture of 7½ grains bluestone and 7½ grains Cooper's Dip. The average weight of these lambs was 22¼ lb., with a maximum of 33 lb. and a minimum of 17 lb.

Result.—Six lambs died within forty-eight hours from poisoning.

Conclusion.—The dose of 7½ grains of Cooper's Dip, added to 7½ grains of bluestone, does not appear to be safe for lambs of three to six months old.

Note.—Unfortunately, no further lambs were available for this experiment at the time, but the question will be again taken up at an early date.

Comparison with Previous Recommendations.

In the leaflet issued by the Division of Veterinary Science in 1907, two recommendations are given for the treatment of wire-worms in sheep, one dealing with bluestone in a liquid form; and the other with Cooper's Dip in a mixture of flowers of sulphur, powdered slaked lime, and common salt.

The following comparison between the quantities recommended in the pamphlet, and the amounts which appear to be safe in the preceding experiments, is of interest.

Bluestone.

The quantities of the liquid bluestone solution (in the proportion of 1 lb. bluestone to 10 gallons of water) recommended in the pamphlet referred to above is as follows:—

- For lambs three to six months old: 1½ to 2 oz., which contains 6·6 to 8·7 grains of bluestone.
- For lambs six to nine months old: 3 oz., which contains 13·1 grains of bluestone.
- For lambs nine to twelve months old: 3½ oz., which contains 15·3 grains of bluestone.
- For lambs twelve to eighteen months old: 4–4½ oz., which contains 17·5 to 19·7 grains of bluestone.
- For lambs eighteen months and over: 5 oz., which contains 21·7 grains of bluestone.

It has been seen in the experiments in this paper that a dose of 22½ grains of bluestone (dry) did not cause any ill effects on thirty full-grown sheep, but when Cooper's Dip powder was added to the bluestone the dose had to be reduced to a mixture of 15 grains of each.

On the assumption, therefore, that a safe dose of Cooper's Dip and bluestone combined for a full-grown sheep would be 30 grains, the dose for lambs would appear to be as follows:—

	A Mixture containing:	
	Cooper's Dip.	Bluestone Powder.
	Grains.	Grains.
For lambs three to six months old	4·4 to 5·8	4·4 to 5·8
For lambs six to nine months old	8·7	8·7
For lambs nine to twelve months old	10·2	10·2
For lambs twelve to eighteen months old	11·7 to 13·1	11·7 to 13·1
For lambs eighteen months old and over	14·5	14·5

Referring to Experiment No. 12, on lambs, it will be seen that a dose of 7½ grains Cooper's Dip, added to 7½ grains bluestone, proved to be fatal for six lambs (varying in ages from three to six months old) out of thirteen, or 46 per cent. This would indicate that lambs are more susceptible to Cooper's Dip and bluestone than adult sheep, and this fact should be taken into consideration when dosing them. It is probable that about one-third less than the above doses would be more satisfactory, but the matter requires

further experimental investigation, and this will be undertaken at an early opportunity.

Cooper's Dip.

The second prescription given in the pamphlet referred to above is the following :—

Cooper's Dip	1 part.
Flowers of sulphur	3 parts.
Powdered slaked lime	3 parts.
Common salt	30 parts.

The dose recommended is one teaspoonful of the mixture for an adult sheep, to be given daily for a week.

In other words, a full-grown sheep would receive seven teaspoonfuls of the mixture in a week, of which seven-thirty-sevenths was Cooper's Dip, or, allowing for an average teaspoon to hold 60 grains, a sheep would consume, approximately, 11 grains of Cooper's Dip in a week.

A reference to Experiment No. 11 shows that on an average a sheep consumed (by licking) 11 grains of Cooper's Dip and 11 grains of bluestone daily for a period extending over nearly a month, so that, on this experiment, it would appear to be safe to increase the proportion of Cooper's Dip in the mixture quoted above. Attention must, however, be drawn to the fact that the sheep should only partake of the dry lick, and in dry weather. The addition of liquid to powdered bluestone appears to increase its toxicity to a considerable extent, and, under such conditions, ill effects may follow.

GENERAL RECOMMENDATIONS.

One important point that is brought out in these experiments is that a safe dose of a mixture of Cooper's Dip and bluestone, when mixed with two substances which are considered to be harmless, such as salt and sulphur, became toxic, and caused death amongst the treated sheep. It is also possible that local conditions on the different farms may influence the toxicity of the mixture ; ce tain farms are more brackish than others, and it is quite within the bounds of possibility that the salts acquired by sheep grazing on such farms would increase the toxicity of an otherwise safe mixture.

Accordingly, a farmer who wishes to take advantage of the results of the investigations detailed in this paper, and who, for any reason, wishes to increase the dose of any of the drugs, is strongly recommended to experiment first of all on a small number of sheep, taking care that the initial trial is conducted under the representative conditions existing on his farm. If this experiment proves successful it should be repeated on a larger scale, and only when the farmer has convinced himself by trials on a number of sheep, that he has found the doses which meet the conditions on his farm should he dose the whole flock. It is only by carefully experimenting in this way that a farmer will be able once and for all to arrive at the correct dose for his own sheep on his own particular farm.

Note.—The application of the drugs referred to in this article for the treatment of worms in sheep will be dealt with in a future publication.

Appendix.

THE POST-MORTEM LESIONS OF ARSENIOUS OXIDE POISONING.

Note.—There were only two sheep which died of poisoning from arsenious oxide. It is advisable to give these two post-mortem records separately, as the number is not sufficiently large to summarize.

DETAILS OF THE POST-MORTEM LESIONS.

No. 1. Hamel No. 2409, weight 75 lb., condition fair.

The lungs were hyperaemic and oedematous; the trachea contained a little foam, and the bronchial lymphatic glands showed a haemorrhagic infiltration.

The pericardium contained no liquid; the heart was distended with coagulated blood. The inner walls were normal, but the outer walls exhibited numerous petechiae.

On opening the peritoneal cavity some ingested food was found in the cavity, part of the wall of the rumen was attached by means of fibrinous deposits to the peritoneal wall.

Towards the pylorus the abomasum showed a hole with a diameter of about 2 inches, the margins of which were yellowish in colour, and showed haemorrhagic infiltration.

The parenchyma of the liver was pale-yellowish and soft in consistency. There was no bile in the gall bladder. On the surface of the liver there was present a fibrinous deposit.

The spleen measured 6 × 4 inches, the pulp was moist and soft, and on the capsule were a number of blood spots.

The omasum was normal. The mucosa of the duodenum was hyperaemic. There were patches of diffuse hyperaemia in the mucosa of the jejunum, and in the ileum the blood-vessels were injected. There was a patchy hyperaemia of the mucosa of the large intestines.

The kidneys were diffusely reddened, especially in the cortex of each.

Cause of Death.—Perforation of the fourth stomach, peritonitis, and gastro-enteritis.

No. 2.—Hamel, condition fair.

The lungs were hyperaemic; the blood-vessels of the mucosa of the trachea were injected, and the bronchi contained some food. The pericardium contained but a few drops of liquid.

The heart contained blood clots. Both inner and outer walls were normal.

On opening the peritoneal cavity a quantity of turbid liquid was found, and the outer surface of the rumen was covered with a fibrinous deposit.

The liver was swollen; on section hyperaemia was noticeable; the lobuli were distinct, and the parenchyma was soft. The bile was of a brownish colour.

Towards the pyloric extremity the abomasum showed a hole the size of a shilling-piece; the outer aspect of the wall of the abomasum

surrounding this hole was of a greyish colour. The mucosa of the abomasum surrounding the hole had disappeared over an area extending to about the size of a man's hand. The folds of the fundus portion were swollen.

The mucosa of the duodenum, jejunum, and ileum was diffusely reddened, that of the caecum and colon was swollen and diffusely hyperaemic.

The parenchyma of the kidneys was red and soft.

Cause of Death.—Perforation of the fourth stomach, peritonitis, and gastro-enteritis.

Conclusion.—Poisoning with arsenious oxide produces a cauterization of the mucous membrane of the fourth stomach, as a result of which perforation may ensue, and the contents of the stomach escape into the peritoneal cavity, causing peritonitis.

The lesions of gastro-enteritis and nephritis in these two cases are probably of a secondary nature, and are due to a septicaemia consequent to the peritonitis.

POST-MORTEM LESIONS OF COOPER'S DIP POISONING.

Note.—In cases of poisoning by Cooper's Dip death occurred in the majority of instances within the first twenty-four hours after dosing; in some cases forty-eight hours elapsed, and only on a few occasions did death occur after an interval of a few days. We may, therefore, from a clinical point of view distinguish an acute poisoning, where death occurred within the first forty-eight hours, and sub-acute poisoning where it occurred after a longer period.

SUMMARY OF POST-MORTEM LESIONS.

Most of the animals were in good condition. Rigor mortis was present in almost every case. In several instances there was a yellowish discharge from the nostrils.

Only in exceptional cases were the lungs found to be normal; they were usually hyperaemic. On section oedematous liquid escaped. There was foam in the bronchi and the trachea, and their mucosae were injected or hyperaemic, this probably having occurred during the agony. The bronchial and mediastinal lymphatic glands were, as a rule, congested.

The pericardium was in most cases found to contain traces of liquid; only in a few instances was a small amount met with.

The blood in the cavities of the heart was almost invariably coagulated.

In a few instances the ventricles were found to be empty, but in the majority of cases they contained well-formed clots.

The left endocardium was rarely found to be normal; usually petechiae, ecchymoses, and even haemorrhagic patches were present. The right endocardium was rarely affected; the vessels of the epicardium were usually injected.

The liver was, as a rule, slightly swollen and discoloured, and varied in colour from light to dark brown.

The lobulation was occasionally indistinct, but more frequently quite distinct, and a venous stasis was noticeable.

The parenchyma was softened and easily friable.

The gall bladder was found empty in a few instances, and in others contained a little bile, which was usually viscid and of a pale-yellowish colour; rarely of a greenish hue.

The spleen was, in the majority of cases, enlarged.

The capsule was distended. The pulp was dark-red, soft, and protruding on section. The trabeculae were not distinct.

The omasum was in almost every case normal; in some instances it was found empty.

The abomasum was in one case practically normal; in the majority of instances a patchy hyperaemia was present, and in others extended into a diffuse infiltration of the whole mucosa; only in rare cases was there a distinct extravasation of blood into the mucosa.

The duodenum was usually slightly swollen, and there was either a patchy or diffuse hyperaemia of different intensity extending throughout the jejunum and ileum, in which latter it became, as a rule, less marked.

The blood-vessels of the caecum were usually congested, and, in some cases a patchy hyperaemia was present. Similar conditions were found in the colon.

The kidneys were almost without exception intensely congested, the hyperaemia being uniformly distributed over all three zones. The parenchyma was softened, and the capsule was easily detachable.

In cases of a few days' standing, the symptoms were very much the same as those described above, but there was a greater tendency towards the extravasation of blood on to the surface of the mucosa of the stomach and, in one instance, there was a superficial necrosis of the mucosa.

Conclusion.—Cooper's Dip is a substance which apparently is easily and quickly absorbed and distributed throughout the whole system. It affects all organs, causing an inflammation of the stomach and the intestines, a swelling of the liver, which is found on microscopical examination to be due to stasis of the blood, this being accompanied by a fatty degeneration of the peripheral portion of the liver lobules. A swelling of the spleen and an inflammation of the kidneys are frequently noted.

Sub-acute poisoning with Cooper's Dip is accompanied by the same lesions.

POST-MORTEM LESIONS OF BLUESTONE POISONING.

Note.—The majority of sheep died within from twenty-four hours, and a few within thirty-six hours.

SUMMARY OF POST-MORTEM LESIONS.

Nearly all the sheep were in good, or at least in fair, condition.

Some of the sheep showed an accumulation of mucus in the mouth, and a bluish deposit on the tongue.

Only in rare cases were the lungs found normal; in the majority hyperaemia and oedema were present. The pleurae had a swollen appearance in some cases. On section, foamy liquid was found on the surface of the mucosa of the bronchi and trachea. The mediastinal and bronchial lymphatic glands were normal, and in some cases slightly enlarged, and even haemorrhagic.

In a few cases an abnormal quantity of liquid was found in the pericardium, although, as a rule, there were only traces of it. The blood was invariably found to be coagulated. The ventricles contained well-formed clots in some cases, in others they were empty.

Frequently the left endocardium was normal, but sometimes petechiae or ecchymoses were noted. In the majority of cases the right endocardium was normal; petechiae were rarely found.

The epicardium was usually normal, but in some cases the vessels were congested.

The liver, in the majority of cases, had a palish appearance, both on surface and section; the consistence was soft, and the lobulation was in almost every case distinct.

The bile was of thinner consistency, varying from green to yellow in colour.

The spleen was swollen in almost every case; the pulp was dark-red and softened, and even protruding; trabeculae in most cases were indistinct.

The abomasum showed a greenish-yellow discolouration of the mucosa, a patchy hyperaemia surrounding superficial erosions of the mucosa, or a general diffuse hyperaemia of the whole mucosa.

The omasum showed in almost every case patchy hyperaemia and greenish patchy discoloration of the mucosa.

The duodenum showed, as a rule, diffuse hyperaemia; in other cases patchy hyperaemia, and in some instances ecchymoses.

The jejunum was normal in some cases, although it usually showed a diffuse hyperaemia.

The ileum was less affected, being normal in several instances, or else showed a patchy hyperaemia, and only in rare cases was a diffuse hyperaemia present.

The caecum was, in the majority of cases, also normal; in some instances the vessels were injected, and in others hyperaemic patches were noted. The contents were liquid, and usually of a greenish colour.

In some cases the colon was normal; very often the blood-vessels were found injected, and in others a patchy hyperaemia was present. The contents were usually of a greenish colour.

In one case only were the kidneys found to be normal. A distinct hyperaemia of all three zones was noticeable; in the remainder the consistence was soft, and the capsule was easily detachable.

Conclusion.—Bluestone apparently affects the mucous membrane of the mouth and of the omasum to a certain extent, but it has a distinct action on the mucosa of the abomasum, where it forms a greenish deposit, cauterizing the underlying mucosa, causing a severe inflammation and erosion of the superficial layer. Similar to Cooper's Dip, it is absorbed into the system, and produces a fatty degeneration of the liver, a swelling of the spleen, and inflammation of the kidneys.

POST-MORTEM LESIONS FOUND IN SHEEP WHICH DIED AFTER DOSING WITH A MIXTURE OF ARSENIOUS OXIDE AND BLUESTONE.

Clinically, two forms must be distinguished, the acute poisoning where death occurred within the first ten days after dosing, and chronic poisoning. when death ensued after the lapse of some weeks (nineteen days, twenty-four days, one month, and five weeks respectively).

The Acute Cases.—Acute poisoning (two cases: one after an interval of thirty hours, and one after three days).

The lesions were those of acute gastro-enteritis, and resembled those described under bluestone poisoning.

The Chronic Cases.—The characteristic lesion was the prolapse of the fourth stomach through an orifice in the abdominal wall. At the place where the prolapse had occurred was a corresponding orifice in the wall of the abomasum, so that the mucosa was exposed to the outer air. The mucosa of the abomasum was thickened, diffusely hyperaemic, covered with coagulated blood, and soiled with earth, showing erosions, and in some cases extensive ulcerations.

Note.—None of the animals died. As soon as the above conditions were noticed the animals were killed.

Conclusion.—The typical lesions in combined arsenical and bluestone poisoning seemed to be an ulceration of the mucosa of the fourth stomach, which penetrated through the wall of the abdomen, causing an opening through which the everted stomachs prolapsed.

It was noticed before that arsenious oxide causes similar ulcerations, but the joint actions of the two corrosives is probably responsible for the severe lesions.

POST-MORTEM LESIONS FOUND IN SHEEP DOSED WITH BLUE-STONE AND COOPER'S DIP.

The post-mortem lesions were those of a gastro-enteritis, as already described under Cooper's Dip poisoning; the same lesions were also found in the sheep which died after an addition of sulphur and salt had been made.

Experiments with Ostriches—XIX.

THE ANATOMY AND PHYSIOLOGY OF THE OSTRICH.

B.—PTERYLOSIS.

By Professor J. E. Duerden, M.Sc., Ph.D., A.R.C.S., Rhodes University College, Grahamstown.

Viewed under ordinary circumstances the ostrich appears to have its whole body and wings provided with feathers, the legs only being naked. For the most part the feathers overlie one another, and so form a very efficient covering for protection and keeping in the heat of the body. On a very hot day, however, birds will often be seen cooling themselves with all their feathers standing erect and the wings partly outspread. Then it is easily noticed that the feathers are not evenly distributed over the entire body, but that naked spaces occur from which feathers are altogether absent, separating areas over which feathers are present. Such a conspicuous naked space occurs along each side of the body. When lying flat the overlap of the feathers covers the naked spaces. In addition it will be observed that the feathers are arranged in more or less definite rows, not irregularly.

Similar conditions to those met with in the ostrich occur in nearly all other birds. Though seemingly altogether covered, the feathers are only developed over special tracts of the body, the naked spaces being hidden by the overlapping of the feathers. The tracts over which feathers occur are known as *Pterylae* and the spaces from which they are absent as *Apteria*. The entire arrangement over the body of the feather tracts or pterylae and the featherless spaces or apteria is known as *Pterylosis*. The study of the pterylosis of birds is an important branch of ornithology, being of some guidance in the difficult task of determining the relationships and classificatory position of birds.

In the ostrich the pterylosis or feather arrangement can be best made out on young chicks. In a dead chick all the down feathers can be completely plucked off in a few minutes, and then the pterylae and apteria are clearly displayed. Small pimple-like projections on the surface represent the sockets from which the feathers have been drawn, hence their arrangement naturally corresponds with that of the feathers. It was from such a chick that the two drawings, Figs. 1 and 2, were made, the one showing the arrangement of the feathers from above and the other from below. It is not generally realized that even in the newly-hatched chick of the ostrich the complete number of feathers which the adult bird will ever possess is already present; moreover, the later feathers will all grow from the same

feather sockets as those present at the beginning. Therefore the general arrangement of the feathers in the young chick is the same as that in the adult.

Figure 1 gives a view of a plucked chick as seen from above, the black dots representing the sockets. It is seen that practically the whole of the dorsal surface is provided with feathers, the only naked

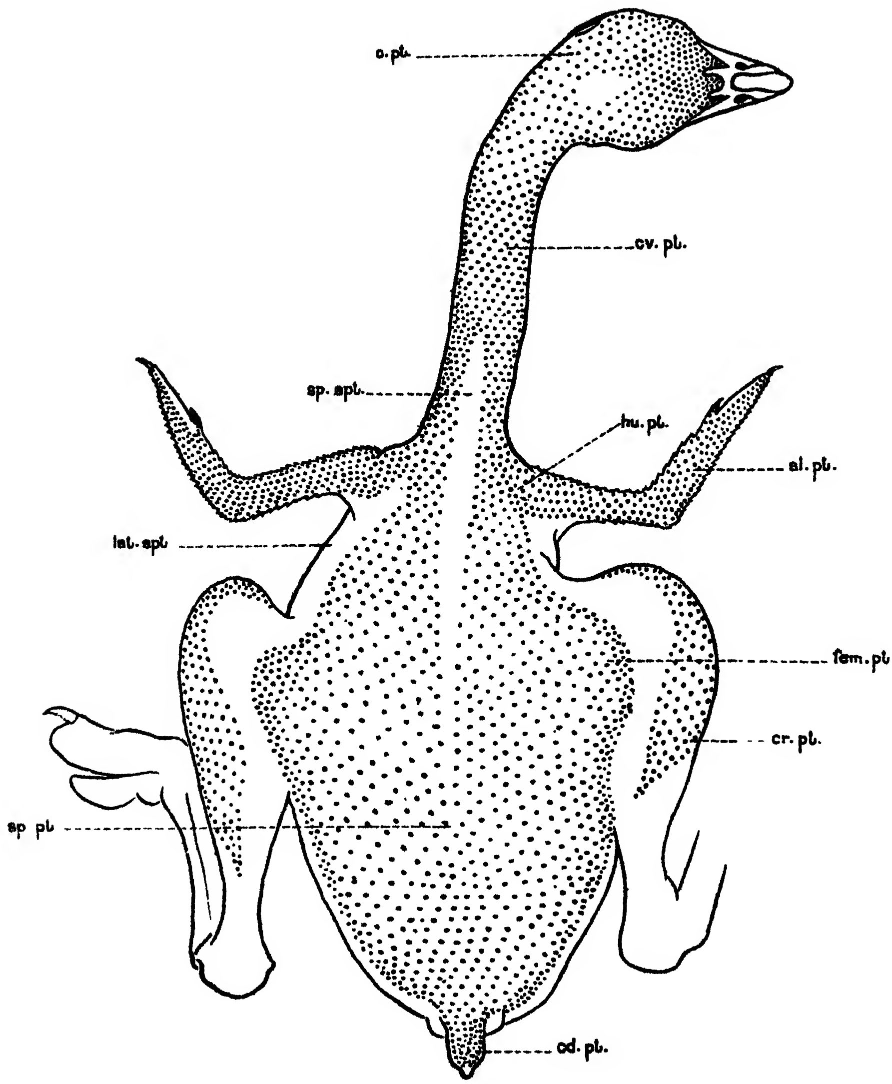


Fig. 1.

space being a narrow area in the angle between the neck and the body. The featherless spaces of the sides of the body and over the legs are however seen in such a view. On the hinder part of the head is a small naked oval patch present in some chicks but not in all. The very small feathers of the neck are arranged closely, while the

larger contour feathers on the back are further apart. The feathers on the short projecting tail are also close together.

The upper surface of the outspread wings, which becomes the outer surface when the wings lie flat, is also closely covered with feathers, and along the hinder edge, from the elbow to the tip of the wing, are situated the large valuable wing plumes, while next the edge are the two or three rows of wing coverts which constitute the *blacks* in the cock and the *drabs* in the hen. The claws on the first and second fingers are shown, while the third finger is hidden beneath the skin.

The second figure gives the appearance of a plucked chick when laid on its back and viewed from below. The neck is uniformly and closely covered with small down-like feathers. The under surface of the outspread wing, which is the inner surface when the wing is at rest against the side, is naked except for a single row just within the hinder edge. The feathers here are the single row of under-coverts or *floss* of the bird, forming what is fancifully known as the *blanket*, serving as it does to keep the sides of the body warm when the wings are clipped.

Along the mid-ventral line of the body is a narrow naked space which broadens in front over the breast-plate and behind over the pubis. In older birds the naked skin in both these places is greatly hardened by the bird resting upon it, the front thickening being the *sternal callosity* and the hind the *pubic callosity*. In the middle of the narrow part is seen the *navel* of the chick, which, however, disappears later. On each side of the ventral apterium are the large ventral tracts, the feathers of which cover the under surface of the body.

A broad naked space occurs along each side of the body, and is by far the largest of all the apteria. It is continuous from the under surface of the wing, over the ribs, and along the entire side of the body and inside of the leg, while behind it meets with the corresponding naked patch from the other side. The under surface of the tail is also naked, with the exception of a few small feathers around the vent or cloacal opening. In such a view the feathers covering the outer surface of the upper part of the leg, the calf, are well shown, but the naked space over the inside of the thigh is rather obscured. The feathers on the outside of the leg, for the most part, all drop out as the bird attains maturity, the limb being then wholly naked.

In technical language the pterylosis of the ostrich may be thus described. The head tract or cephalic pteryla is complete, except for a small space above; the neck tract or cervical pteryla is divided below by a narrow median space, the spinal apterium, which passes a short distance along the back; otherwise the large dorsal tract or spinal pteryla is continuous and passes into the thigh tract or femoral pteryla. The wing tract or alar pteryla is continuous with the arm tract or humeral pteryla and with the cervical, spinal, femoral, and caudal pterylae. The leg tract or crural pteryla is disconnected from all the others and occurs only in young birds.

The under space or ventral apterium is well developed and enlarges in front and behind; the under tracts or ventral pterylae are large and include all the feathers on the under surface of the bird. The side spaces or lateral apteria are large and extend the full length of the body and are continuous with the alar, femoral, ventral, and caudal apteria.

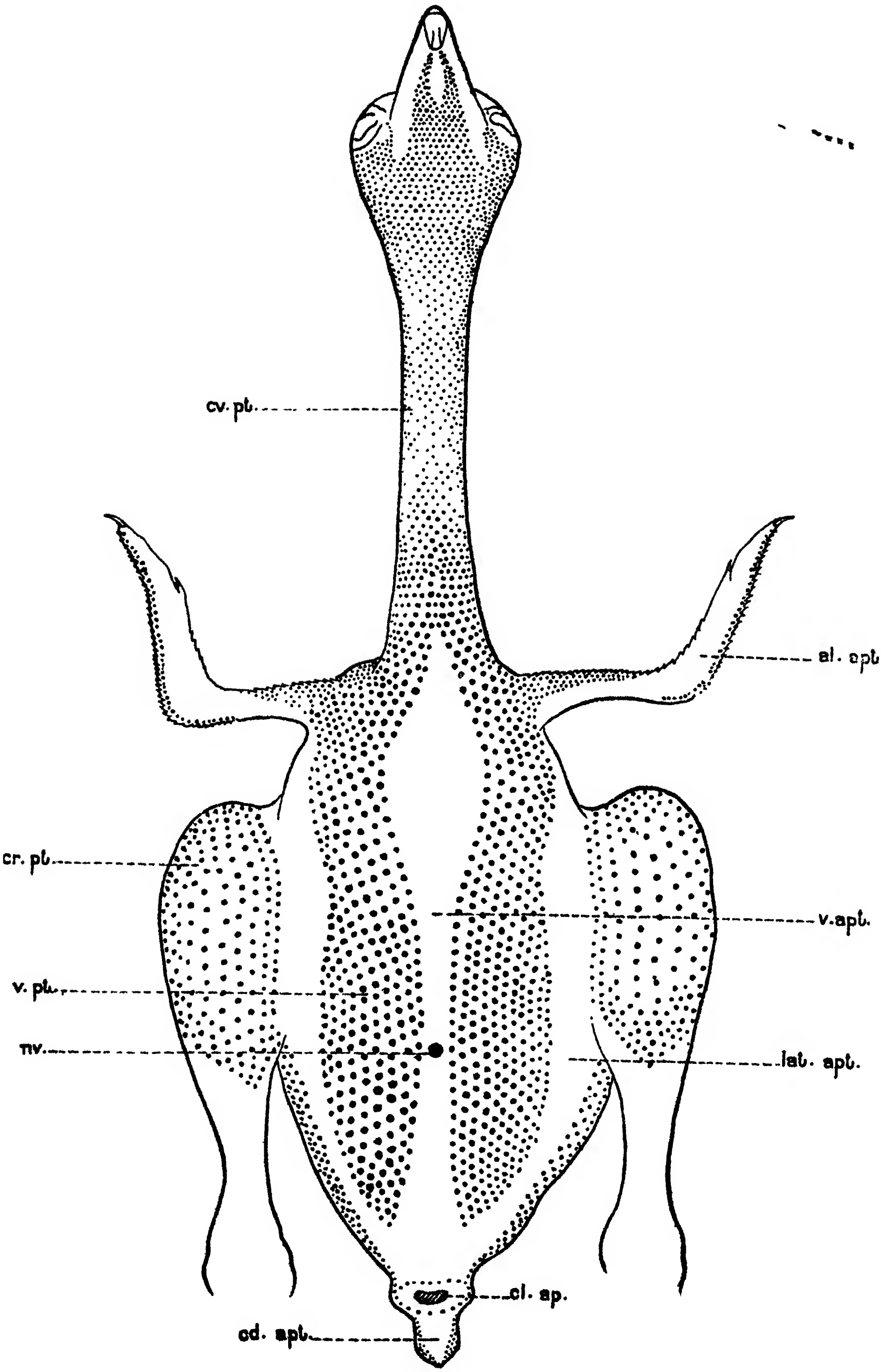


Fig. 2.

It is of some interest to note that in zoological works it is usually stated that in the ratitae or running birds, the group of birds to which the ostrich belongs, the pterylosis is ill-defined, that is, no proper arrangement into pterylae and apteria can be made out. The figures given above show, however, that this statement does not hold for the ostrich chick, for the feather tracts and featherless spaces are extremely clearly defined; moreover, the arrangement found in the chick exists also in the adult bird.

FIGURE 1.

Plucked ostrich chicks showing arrangement of feather tracts and featherless spaces. Viewed from above.

c. pt., head tract or cephalic pteryla; *cv. pt.*, neck tract or cervical pteryla; *sp. apt.*, dorsal space or spinal apterium; *hu. pt.*, arm tract or humeral pteryla; *al. pt.*, wing tract or alar pteryla; *lat. apt.*, side space or lateral apterium; *fem. pt.*, thigh tract or femoral pteryla; *cr. pt.*, leg tract or crural pteryla; *sp. pt.*, dorsal tract or spinal pteryla; *cd. pt.*, tail tract or caudal pteryla.

FIGURE 2.

Plucked ostrich chick showing arrangement of feather tracts and featherless spaces. Viewed from below.

cv. pt., neck tract or cervical pteryla; *al apt.*, wing space or alar apterium; *cr. pt.*, leg tract or crural pteryla; *v. apt.*, ventral space or apterium; *v. pt.*, ventral tract or pteryla; *nv.*, navel; *lat. apt.*, side space or lateral apterium; *cl. ap.*, vent or cloacal aperture; *cd. apt.*, tail space or caudal apterium.

The Pinery and Orchard Soils of the Bathurst Division, Cape Province.

By J. Lewis, D.Sc., Senior Chemist, Grahamstown.

Prefatory Note by Dr. C. F. Juritz, Chief Chemist.

During a visit to Grahamstown early in 1909, a deputation representing the Bathurst Farmers' Union, introduced by Mr. H. Wood, M.L.A., waited on me and directed my attention to the gradual but steady deterioration of the pineapple crops in the district, expressing the view that the trouble probably originated with the soil, and requesting me to have a full investigation thereof undertaken. I at once directed Mr. Muller, who was then in charge of the Grahamstown Laboratory, to take the subject in hand with all possible speed, but the smallness of the staff then at his disposal effectually prevented the immediate carrying out of this investigation. However, he lost no time in visiting several pineries and collecting a number of typical soils for the purpose of examination when opportunity should allow. It was not until early in 1911 that this opportunity came, consequent on the increase of the Grahamstown staff. Unfortunately, only a few weeks later, it became necessary to transfer Mr. Muller permanently to Capetown, and the investigation, which had not proceeded beyond the performance of a series of mechanical analyses of the soils, came to a complete stand. Dr. Lewis then succeeded Mr. Muller, and I directed him to take up the thread of the investigation. After acquainting himself with the circumstances, he concluded that it would be preferable to start the whole investigation over again from the beginning. This was accordingly done, and the present paper is Dr. Lewis' report on his work in this connection.

Introductory.

In July, 1911, the writer proceeded to visit representative farms in the division and take samples of soil, etc., for analysis. At the same time an opportunity was taken of studying the apple and orange orchards of the farms visited with a view to determining their fertilizer requirements.

The following is the writer's itinerary:—

On 8th August, 1911, Messrs. Oates & Sons' farm, Allandale, in the Kap River valley, was visited, and two samples each taken from the orchard and pinery. Messrs. Oates have a large orchard of apples growing on the hill slope and down in the alluvial soil along the river. The trees in the valley were fertilized two years ago with 4 lb. of lime per tree and are bearing well. Sample "A" was taken from this portion of the orchard. Sample "B" was taken from the hill slope; the soil here is shallow, and the trees, which do not bear well, were fertilized with kraal manure in 1909.

The pineries are situated on a slope above the river on old bush-land facing north-east. Near the river pines would do well were it not for the frosts in winter. The soil is a sandy loam.

Sample 1 was taken from "Frank's Pinery", which is about nine years old and in fairly good bearing, although the pines are getting smaller. Sample No. 2 is from the young pinery, four years old, which is doing well.

On the following day Mr. W. Purdon's farm, Waldon, was visited. The pinery faces in a northerly and north-easterly direction and is situated on old grass veld. The soil is sandy loam a foot deep overlying gravel, and the pinery is seven to nine years old. Two samples were taken, No. 3 from a portion which gives a good crop, No. 4 from a poor patch, where the bushes are small and bear badly.

The next farm from which samples were taken was New Bristol, belonging to Mr. S. Bartlett. The pinery here is eight years old and is bearing poorly, about four pines per annum per bush. The aspect is northerly; the soil, inclined to be sandy, is 12 to 16 inches deep, overlying a gravelly sub-soil. Sample No. 5 was taken here. The orange orchard lies in a deep alluvial soil in a valley bottom. Sample " C " was taken from a good portion, sample " D " from a poor patch at the lower end, where the leaves are yellow and the crop obtained is very small.

Mr. Bartlett, in common with other growers, states that only well-drained virgin soil or old pine lands are suitable for pines. Old cultivated lands are useless, probably because the texture of the land has been rendered unsuitable.

Mr. F. Long's farm Benholm was next visited. Sample 6 was taken from an old pinery now being replanted. The soil here is of good open texture at the surface and becomes more clayey down to a depth of 2 feet 6 inches, when it passes into gravel. Sample 7 was from Mr. Ashton Bradfield's pinery at Clumber. The soil here is deep, in parts gravelly, in other parts very stony. The pinery is a good one, about eight years old.

Sample " E " was taken from the apple orchard of Mr. E. J. Elliot, No. 5 Nottingham Party, Clumber. The trees in this orchard are nine years old, have never been manured, and yield good crops. The soil is a fairly deep light-coloured alluvial loam.

Sample " F " is from a similar but stiffer soil in the orchard of Mr. J. Bradfield, Welford, Clumber. The trees are eight to ten years old and are bearing well.

The last farm visited was Mr. A. J. Ansley's, Trappe's Valley. Here two samples of soil were taken, " G " from an orchard of seven-year-old apple trees which bear poorly and had been given a little basic slag the previous year, and " H " from a good orchard of very old trees, which still yield splendid crops.

Subsequently two samples of soil were forwarded by Mr. E. H. Purdon, of Hamilton: No. 8 from a young pinery, " J " from a young apple orchard, eight years old, which bears splendid crops.

THE PINERIES.

The pineapple industry in the Bathurst Division dates from about the year 1870, when Mr. C. Purdon planted a number of crowns obtained from Natal fruit. Since that date the industry has assumed considerable dimensions, and the average number of pines marketed to-day by the Bathurst Farmers' Union, which includes almost all the growers of the district, is 2,000,000 per annum.

The pine-growing district is practically confined to the area bounded north by the Kap River, south by the Kowie River, west by the Blaauw Krantz River, and east by the eastern boundary of

the field cornetcy of Bathurst. The bulk of the pine farmers occupy a smaller area lying wholly within the field cornetcy of Bathurst and to the south-west of the Kowie Railway, between Martindale and Bathurst Stations. Mixed farming, including ostriches and fruit, is practised in the area, which is grass veld with bush in the valleys.

CLIMATE.

There is no meteorological station between Grahamstown and Port Alfred, but the following data obtained from these two stations will indicate the conditions of temperature and rainfall which prevail over the pine area:—

	GRAHAMSTOWN.			PORT ALFRED.		
	Mean* Maximum Temperature.	Mean* Minimum Temperature.	Mean‡ Rainfall.	Mean† Maximum Temperature.	Mean† Minimum Temperature.	Mean‡ Rainfall.
Jan...	80·1	56·9	2·46	78·2	61·6	1·94
Feb...	82 1	59·5	2·68	78·7	63·8	1·41
March	81·3	58 3	2·83	75·2	60·3	1·77
April..	75 6	52·2	2·26	72 1	56·6	2·67
May...	70·5	46 6	1·69	72·8	53·7	2·38
June..	66 6	42 6	1·97	69·8	46·3	1·65
July..	67 7	41·9	1·13	67·1	47·7	1·68
Aug...	69·0	43·7	1·56	67·8	49·9	2·34
Sept..	70·9	45 6	2·49	68 6	53·1	3·02
Oct...	72·7	48 7	2 90	69·2	53·9	2·62
Nov...	75·9	52·3	3 69	71 3	56·1	3·37
Dec ..	78·8	56·4	2 79	76·6	60·8	2·44
Year..	74·3	50 4	26·72	72·9	55·7	27·21

* Mean of 10 years. † Mean of 3 years. ‡ Mean of 20 years.

The climate, then, is temperate and the rainfall is fairly evenly distributed, though the bulk falls in the summer months. Occasional frosts occur in the winter nights and cause a certain amount of damage to the pines.

PREPARING AND PLANTING THE LAND.

The site chosen for a pinery should have preferably a northerly exposure and be as little as possible subject to frosts. The soil should be a loam or sandy loam, though clay and gravel soils often prove suitable. The essential is good drainage, which is best ensured by a slope to the ground and a gravel sub-soil.

The soil is thoroughly cleared and ploughed as deep as possible and harrowed. The plants are set about 4 inches deep and 2 to 3 feet apart in rows 6 feet wide. This width allows of subsequent cultivation, which is essential to the proper development of the plant. Between the plants the hoe is used to keep down weeds.

A pinery is planted preferably from stumps, i.e. a stem which has borne a pine the previous season. From the suckers developed at the lower end of a stump a good crop is obtained in the second year. Failing stumps suckers are planted, i.e. the shoots developed at the base of the plant. From a vigorous sucker one pine may be

obtained in the first year. The stump or sucker is planted 4 to 6 inches deep without any previous preparation.

In Florida suckers are prepared for planting by stripping off the lower leaves*, but no such precaution seems necessary in Bathurst.

November seems the favourite month for planting, though any time between August and December is suitable, and one grower stated that planting could be done in any month throughout the year. A plantation comes into full bearing in three or four years, after which the production begins to deteriorate in number and size. Fifteen years is considered the limit for profitable production. The life of a plantation is prolonged by thinning out the plants from time to time.

Very different estimates of the average yield were given by different growers. An exceptionally fine pinery in the district yields from ten to twelve pines per bush per annum; a poor pinery gives only four; probably a good average pinery gives per bush annually six to eight pines averaging 1½ lb. in weight. Reckoning 2400 plants per acre this means per acre 16,000 pines weighing 24,000 lb.

The main crop is harvested in March, but fully developed plants will ripen fruit throughout the year, as the numerous suckers are of different age and flower in different months.

ANALYTICAL DATA.

The following are the tabulated analyses of the soils and the average plant and fruit. I have appended analyses of typical Florida pine soil and plants for comparison.

* In Florida the sandy soil holds so little moisture that the lower leaves of the sucker do not rot sufficiently to enable the young roots to spread freely. As a result the roots in the absence of stripping, wind round the stem in a ball, causing the disease known as tangleroot.

CHEMICAL ANALYSIS.

FARM.	No.	On 1 millimetre Product.				Hydrochloric Acid Extract = Plant Food Reserve on ½ millimetre Product.			1 % Citric Acid Extract (Dyer) available Plant Food on 3 millimetre Product		REMARKS.
		Moisture.	Organic Matter.	Chlorine.	Nitrogen.	Lime.	Potash.	Phosphoric Oxide.	Potash	Phosphoric Oxide.	
		%	%	%	%	%	%	%	%	%	
Allandale.........	I	1·43	3·05	·020	·098	·100	·052	·033	·004	·009	Old pinery, deteriorating.
Allandale.........	II	2·19	5·08	·022	·056	·084	·067	·046	·004	·008	Good.
Waldon...........	III	3·03	4·90	·018	·126	·086	·062	·050	·005	·010	Good.
Waldon...........	IV	2·07	2·68	·019	·070	·060	·053	·026	·006	·010	Bad.
New Bristol.......	V	1·19	2·29	·016	·063	·030	·038	·042	·004	·008	Poor.
Benholm..........	VI	6·05	4·72	·018	·140	·050	·063	·087	·005	·013	Good.
Ashton Bradfield's	VII	5·38	4·93	·018	·143	·048	·068	·068	·004	·013	Good.
Hamilton.........	VIII	3·30	5·42	·019	·147	·208	·093	·066	·011	—	—

MECHANICAL ANALYSIS.

FARM.	No.	Pebbles % >3 mm.	Coarse Gravel % 3–2 mm.	Fine Gravel % 2–1 mm.	Coarse Sand % 1–½ mm.	Fine Earth % < ½ mm.	Medium Sand % ·5 – ·25 mm.	Fine Sand % ·25 – ·1 mm.	Very fine Sand % ·1 – ·05 mm.	Silt % ·05 – ·005 mm.	Clay % < ·005 mm.
Allandale..........	I	Nil	Nil	·10	·85	99·05	15·90	30·06	Not determined	Not determined	Not determined
Allandale..........	II	·31	·33	·93	2·90	95·53	10·50	23·34	Not determined	Not determined	Not determined
Waldon.......	III	·07	·14	·19	·95	98·65	6·20	21·84	Not determined	Not determined	Not determined
Waldon...........	IV	Nil	·02	·42	1·31	98·25	8·54	31·04	Not determined	Not determined	Not determined
New Bristol........	V	2·98	·60	·71	·70	95·01	11·9	40·70	10·62	24·59	7·20
Benholm...........	VI	·90	·91	2·09	1·11	94·99	5·8	27·20	16·45	37·36	8·18
Ashton Bradfield's.	VII	·76	·75	1·96	·91	95·62	4·9	21·70	12·26	46·77	9·99
Hamilton..........	VIII	·13	·40	·69	1·00	98·78	—	—	—	—	—

TYPICAL FLORIDA PINE SOILS.

Chemical Analysis.

No.	Coarse Earth.	Fine Earth.	Moisture.	Nitrogen.	Lime.	Potash.	Phosphoric Oxide.
	%	%	%	%	%	%	%
1....	21·00	79·00	·400	·038	·210	·009	·034
2....	24·90	75·10	·294	·025	·108	·011	·019
3....	3·20	96·80	·488	·074	2·232	·061	·054
4....	11·40	88·60	·182	·018	·040	Trace	·042
5....	12·20	87·80	·040	·004	·000	·003	Trace

Mechanical Analysis.

	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very fine Sand.	Silt.	Clay.
	%	%	%	%	%	%	%
A......	·23	3·02	61·11	33·76	·54	·28	·50
B......	·65	12·36	41·42	41·18	2·40	·22	·35

A comparison of the Bathurst and Florida soils brings out many points of difference. The Florida soils are almost pure sand and consequently are little retentive of moisture, while the Bathurst soils are sandy loams and retain a considerable percentage of moisture. The chemical differences are what one would expect from the physical nature of the soils. The average nitrogen, potash, and phosphoric oxide are far higher in the Bathurst soils, indeed in some cases potash and phosphoric oxide are lacking in Florida soils which still bear pine crops *at the cost of heavy fertilizing.*

A comparison of the Bathurst soils among themselves shows us that while in general the soils may be considered of medium quality the pineries are in every case deficient in one or more of the necessary soil constituents. The undoubtedly poor pineries IV and V are lowest in organic matter, low in nitrogen, lime, potash, and phosphoric oxide. The position will appear clearly by arranging the soils in order for each important constituent, the worst soil heading the column.

Moisture.	Organic Matter.	Nitrogen.	Lime.	Potash.	Phosphoric Oxide.
V	V	II	V	V	IV
I	IV	V	VII	I	I
IV	I	IV	VI	IV	V
II	III	I	IV	VI	II

Of poor quality also is No. 1, where the pines are deteriorating in size, although this deterioration may be partly due to the age of the plants.

The following are the analyses of fruit and plant obtained from Mr. W. Purdon's pinery, together with analyses from the United States:—

BATHURST.

	Fresh Fruit. Average weight, 1 lb. 11 oz.	Fresh Plant. Average weight, 66 lb. 9 oz.
	%	%
Moisture	83·86	81·45
Crude fat	1·11	·47
Proteins	·49	·75
Crude fibre	·33	3·25
Nitrogen-free extract	13·51	12·02
Ash	·70	2·06
Nitrogen	·078	·120
Lime	·047	·121
Potash	·358	·356
Phosphoric oxide	·024	·029

AMERICAN ANALYSES.*

	Fruit.	Air dry plant.
	%	%
Nitrogen	·0707	·6815
Potash	·2256	1·3450
Phosphoric oxide	·0423	·8260

A comparison of these figures shows that the Bathurst pines are richer in potash but poorer in phosphoric acid than the fertilized American pines.

The plants (2400) on an acre of soil in Bathurst have absorbed from the soil:

	lb.
Nitrogen	192
Lime	194
Potash	570
Phosphoric oxide	42

while an annual crop of 16,000 pines per acre removes

	lb.
Nitrogen	19
Lime	10
Potash	86
Phosphoric oxide	6

Per 1000 plants the plants take up

	lb.
Nitrogen	80
Lime	80
Potash	240
Phosphoric oxide	17

* Bulletin No. 83, Florida Agricultural Experiment Station.

and the annual crop

	lb.
Nitrogen	8
Lime	4
Potash	36
Phosphoric oxide	3·3

These figures assist in forming an opinion as to the fertilizer requirements of a pinery.

Before proceeding to discuss the fertilizers suitable for the Bathurst pineries it will be useful to consider the experience obtained in other countries.

From an article in the *Union Agricultural Journal* for July, 1911, on "Pineapple Culture in Natal", by N. Johansen, Manager of the Government Experimental Farm, Winkelspruit, which gives the results of fertilizers applied to experimental plots, the following conclusions may be summarized:—

Well-drained chocolate-coloured loams with open sub-soils are most suitable in Natal. Deep ploughing and good cultivation are essential.

Plants should be set 2 feet by 2 feet; suckers are the most suitable portion to plant.

The plants should not be left more than three years in the ground, as the average deterioration in the fruit is 6 oz. per annum. Before replanting a thorough ploughing and manuring should be effected.

September to November are the most suitable months for planting, and the first crop will be produced within twelve months.

Sulphate of ammonia caused luxuriant growth of the plant.

Superphosphate at the rate of 100 lb. per acre proved beneficial.

Sulphate of potash produced large, succulent, and well-flavoured fruit.

Muriate of potash is not so good, producing a light-coloured fruit.

Wood ash gave excellent results, particularly in combination with sulphate of ammonia; 1000 lb. ash with 120 lb. sulphate of ammonia gave very large fruit.

The best results were obtained with 100 lb. superphosphate, 100 lb. sulphate of potash, and 500 lb. wood ash* per acre. This mixture gave uniform fruit with moderate crowns and of good keeping quality.

PORTO RICO.

In Porto Rico† pineapple culture is practised successfully in soils which vary from sands to clays. The methods of planting range from single rows in ridges 6 feet apart up to twenty rows 18 inches apart, depending on the soil and site, the amount of ground water, and the natural drainage. The plants are set usually 12 to 22 inches apart. One, two, or three-rowed beds suffer from the wind.

Suckers, slips, and crowns are used for planting.

Young plants give better growth and fruit than older plants, but the crop is later in coming to maturity.

* In such a mixture the acidity of the superphosphate would be entirely neutralized.

† Bulletin No. 8, 1909, Porto Rico Agricultural Experiment Station—"Pineapple Growing in Porto Rico."

In sandy localities the plants are stripped of their lower leaves before planting to prevent tangleroot. For loamy or clay soils this precaution is unnecessary.

In applying fertilizers the material is scattered so as to lodge in the leaf axils of the plant. This is the only practicable method where the pines are grown in beds, and has the advantage of delivering the fertilizer immediately round the stem, to be carried down by rain to the short, shallow root system. With such a method the use of compounds like superphosphate, nitrate of soda, sulphate of ammonia, and even basic slag is liable to cause injury to the leaves and crown of the plant.

The Porto Rico Agricultural Experiment Station* recommends the application of fertilizer several times in the year. In sandy soils a suitable mixture is one containing

8 lb. Phosphorus,
10 lb Nitrogen,
20 lb Potash,

per 1000 plants per annum. A small application of a nitrogenous fertilizer should be made at planting, and three applications of a complete fertilizer at intervals of two, four, and six months. The materials recommended are blood, cottonseed meal, bone meal, basic slag, sulphate of potash. Nitrate of soda and superphosphate should be used with great caution, if at all.

The above quantities are for sandy soils. On loam soils the nitrogen may be reduced or omitted and the phosphorus and potash reduced to one-half.

UNITED STATES.

In 1901 the United States Department of Agriculture issued a farmer's bulletin No. 140 on pineapple growing, from which the soil analyses on page 362 were taken. From this bulletin the following statements are summarized:—

"The best pineapple region in the world has a mean temperature of 75° to 80°. Jupiter, in the midst of the pineapple region of Florida, has a mean annual temperature of 73°."

The soil must be of a loose and open nature and not allowed to become water-soaked. "It is not the fertility nor the humus in the soil that is detrimental to the pineapple, but it is the want of free drainage." Gardeners grow pines in a soil made up of fibrous loam, well-rooted manure, and coarse pounded bone and shells. Moderate winter rains and free summer rains are necessary.

Poor soils, such as the Florida sands, are capable of repaying pineapple cultivation if their texture is right. The claim is made that in the States poverty of soil is hardly a disadvantage, as, given the proper fertilizers, the quality and size of the fruit may be regulated to meet the requirements of the market. "There is considerable land that produces good pineapples without the use of any fertilizer, but it appears that the best and finest pineapples and likewise the finest crops are produced on land that has to be heavily fertilized."

The mode of fertilizing varies with the locality and seems largely a matter of the experience of the individual grower. Some growers fertilize once a year during the autumn or summer, others make one

* *Loc. cit.*

application in winter and a second after the crop has been gathered, others again give three applications, after cropping, in autumn and in the late spring or early winter. It is probable that any time would be suitable, but the best time is a matter for individual experience.

Of *nitrogen fertilizers* cottonseed meal and dried blood are most suitable. Nitrate of soda must be used with caution, as it is apt to kill buds when thrown on them. It should be evenly distributed in small doses several times a year. It is liable to produce a luxuriant but tender growth.

Sulphate of ammonia is inferior to nitrate of soda and should never be supplied alone.

Potash fertilizers.—In pine soils rich in potash, e.g. New Zealand and Philippines, potash fertilization is not required. Sulphate of potash and wood ashes are the best available sources of potash. In the case of ashes the composition is so variable that without an analysis it is difficult to determine the value of any particular parcel. Kainit and muriate should not be used.

Phosphoric oxide.—Bone meal, which also supplies nitrogen, is valuable; guano is excellent, also fish guano. Superphosphate should be avoided.

The formula recommended in this bulletin for soils that are deficient all round is:

1 phosphoric oxide
4 nitrogen
6 potash

which differs considerably from the later recommendations of the Porto Rico and Florida Experiment Stations.

The amounts per acre of the different fertilizers are:

Nitrogen....................	200 lb. dried blood; or
	400 lb. cottonseed meal; or
	150 lb. nitrate of soda; or
	120 lb. sulphate of ammonia.
Potash............ . .	120 lb. sulphate.
Phosphoric oxide*.	120 lb. bone meal; or
	120 lb. guano; or
	120 lb. fish scraps.

Farmyard manure is valuable if well rotted.

FLORIDA.

Bulletin No. 83, 1906, of the Florida Agricultural Experiment Station deals with an elaborate series of experiments extending over three years, conducted by the station in co-operation with a firm of growers. The plants were set 20 inches by 20 inches apart in the typical pine soil of Florida. The subjoined analysis shows the poverty of such a soil:—

	%
Lime..................................	·0087
Potash................................	·0061
Phosphoric oxide......................	·0087
Nitrogen..............................	·0100

It was found that superphosphate, nitrate of soda, sulphate of ammonia, muriate of potash, and kainit were each more or less

* These also contain nitrogen.

injurious to the plant and inferior in every respect to basic slag, bone meal, blood meal, cottonseed meal, and sulphate of potash.

The final recommendations of the investigators may be quoted almost *in extenso*:—

"As a source of phosphoric acid, fine ground steamed bone has given very general satisfaction, while both bone meal and slag phosphate have given good results in our experimental work. If acid phosphate is used, lime should be added every year or two at the rate of about 750 lb. to the acre. Dissolved bone-black may be used if it is known to be genuine. However, as previously stated, it may be well to avoid these two sources of phosphorus.

"As sources of nitrogen, dried blood and cottonseed meal may be used. Nitrate of soda may be used for the first six months and possibly, to a limited extent, for the first year, but after the first year it will probably be safer to eliminate it entirely. Considerable caution is required in its use.

"Of the potash salts used, high and low grade sulphate have given the best results, the latter seeming slightly the better. Muriate has given fair results, though the sulphate undoubtedly gives better results. Kainit should not be used. High-grade tobacco stems, though not used in this experiment, have been used by a number of growers with good results.

"For most of the East Coast soils we would recommend 3500 lb. to 4000 lb. to the acre annually of a fertilizer analysing 4 per cent. available phosphoric acid, 5 per cent. nitrogen, and 10 per cent. potash, to be applied at the rate of four applications a year for the first eighteen months, and after this two applications a year, one in February or March as the conditions may require, and one soon after the removal of the summer crop. However, some very successful growers recommend three applications as follows:—About 1400 lb. of a standard fertilizer in February and again after the removal of the summer crop, and 1000 to 1200 lb. high-grade tobacco stems in the fall or early winter. A regular application of a growing fertilizer at the beginning of winter has been found objectionable, in that the plants, if started to growing rapidly, are much more susceptible to injury by the cold weather which may come in January or February."

The chief fertilizers available in South Africa, which are suitable for application to pineries, are:—

Sulphate of potash, nitrate of soda, basic slag, bone meal, blood meal, whale guano, wood ash, and (to be used with caution) sulphate of ammonia.

Kraal manure and guano require to be tested, and if proved suitable would in most cases prove very cheap sources of phosphoric oxide, nitrogen, and, in the case of kraal manure, potash. There seems no reason against the use of guano, but one would hesitate to recommend kraal manure without previous trial.

The percentage composition of these fertilizers is roughly as follows:—

	Nitrogen.	Available Phosphoric Oxide.	Potash.
Sulphate of potash	—	—	50
Nitrate of soda	15	—	—
Sulphate of ammonia	20	—	—
Blood meal	8–11	5	—
Guano	11	10	2
Basic slag	—	15	—
Bone meal	4	14	—
Whale guano	10	—	—
Wood ash	—	2–3	3–6
Kraal manure	1–2	2–3	2–3

The following mixtures will be found suitable for pines. The constituents should preferably be purchased separately and thoroughly mixed on the farm:—

	LBS	Approximate Composition. Nitrogen.	Potash.	Available Phosphoric Oxide.
Bone meal	600	120	250	80
Blood meal or whale guano	900			
Sulphate of potash	500			
Basic slag	700	120	250	100
Nitrate of soda	800			
Sulphate of potash	500			
Guano	1500	165	280	150
Sulphate of potash	500			

These quantities should be sufficient for 6000 to 8000 plants *per annum*. Two applications a year should be made, or in the case of nitrate of soda three applications. If old kraal manure is used it should be supplemented with sulphate of potash to the extent of 30 lb. for every ton of kraal manure.

Finally, it should be noted that these recommendations are experimental. A grower should be prepared to try more than one mixture and to vary the proportion of the various ingredients in accordance with the results of his observations. If, for example, he finds that he obtains a luxuriant growth of the plant with no corresponding improvement in fruit, he should lessen the proportion of nitrogenous material in his fertilizer. Only by such trials, carefully recorded, can he expect to obtain the best results from his expenditure, and secure a permanent improvement in his crop.

ORCHARD SOILS.

The following are the results of the analyses of the orchard soils:—

NAME OF FARM.	No. OF SAMPLE.	FINE EARTH < ½ mm.	ON 1 MILLIMETRE PRODUCT.				HYDROCHLORIC ACID EXTRACT PLANT FOOD RESERVE ON ½ MILLIMETRE PRODUCT.		
			Moisture.	Organic Matter.	Chlorine.	Nitrogen.	Lime.	Potash.	Phosphoric Oxide.
		%	%	%	%	%	%	%	%
Allandale............	A	97·51	1·376	3·632	022	·098	·204	·043	·042
Allandale............	B	94·78	1·696	3 482	·021	126	·128	·081	·039
New Bristol..........	C	97·33	·694	1·194	·014	·042	·038	·034	·024
New Bristol, No. 5...	D	95·43	·428	738	·015	·049	·020	·031	·043
Nottingham Party....	E	98·65	2·484	2 814	018	·084	·040	·083	·073
Clumber.............	F	98·00	5·240	3 432	018	·098	·082	·107	·067
Trappe's Valley......	G	94·79	2·178	1·790	·017	·070	·020	·044	·050
Trappe's Valley......	H	99·50	3·198	2·584	·014	·084	·086	·036	·062
Hamilton............	I	98·07	·966	1·518	·020	·042	·080	·046	·041

Of the apple soils, A, E, F, H, and I (a young orchard) were stated to be satisfactory, B and G to be poor. From the analysis no reason for the comparative poverty of B can be adduced, for while inferior to A in lime it yet contains a higher percentage than all the other soils, while it is actually superior to A in nitrogen and potash content, and practically the same with respect to phosphoric oxide. Its inferiority is probably due to its situation and comparative shallowness of soil.

On the other hand, a comparison of H with G shows at a glance the reason for the inferiority of the latter orchard. The deficiency in lime is largely responsible, and it may safely be predicted that no other soil will respond so well to a thorough fertilization with lime.

With regard to the orange orchard at New Bristol, of which the portion C is bearing satisfactorily, while D is poor and shows yellowing of the leaves, it is evident that the soil throughout is poor and the trees on the better portion may be expected to fail in a few years. An application of lime to D may cause an improvement. I am inclined to ascribe the yellowing to the situation of the trees in the lowest corner of the land, where drainage is imperfect and water-logging would likely cause malnutrition.

With regard to the material requirements of these orchards it may be said that no careful individual experiments on fruit trees have been recorded in South Africa, while comparatively few are available from other countries, and that owing to the habit of growth, the depth and range of the roots, the plant food required by the tree as well as by the crop, the manurial requirements of fruit trees are particularly difficult to gauge, and the necessity exists for every grower who is dissatisfied with his yield to make his own experiments. All that can be done here is to indicate the chief deficiencies of the soil and the fertilizers which will supply those deficiencies.

Generally it may be said that the average composition of the soils analysed shows them to be poor in lime, potash, and phosphoric oxide; B, E, and F contain satisfactory percentages of potash, E, F, and H of phosphoric oxide, while for apples A is the only one whose lime content is satisfactory. It is certain that all the other apple soils will be improved by an application of lime, in particular E and G; 4 lb. to 8 lb. per tree might well be applied. C, D, and J, which are deficient in nitrogen, should be fertilized with nitrogenous manure—guano, which, having regard to its manurial value, is the cheapest fertilizer on the market, should be applied at the rate of 8 lb. per tree. This amount would also supply lime and sufficient phosphoric acid for the requirements of the crop.

The other soils, which are not so poor in nitrogen, may be fertilized with basic slag; 6 lb. per tree would supply about 2½ lb. of lime and about 1 lb. of phosphoric oxide. Even here, however, guano might prove more profitable. It must be noted that guano and basic slag or guano and lime should never be mixed, as such a mixture always results in a loss of nitrogen. Instead of these phosphatic manures bone meal may be applied supplemented with a little nitrate of soda or sulphate of ammonia for nitrogen-poor soils.

Sulphate of potash is the most convenient form of applying the potash fertilizer, which is required by all the soils except possibly E, F, and H. The quantity should be from 3 lb. to 5 lb. per tree.

The orange crop will benefit particularly from such an application of potash.

In conclusion, I gladly express my obligations to Mr. E. V. Flack, analyst in this institution, for the analytical work involved in this investigation.

The Construction of Cow-byres.

By W. S. H. Cleghorne, B.Sc., A.M.I.Mech.E., Lecturer in Engineering, School of Agriculture, Potchefstroom.

Numerous inquiries regarding the construction of cow-byres or cow-sheds have of late been received here, so that a short paper on the subject may not be out of place.

Main Types.—Two principal types may be mentioned, viz.:—The single byre and the double byre. In the former the cows are ranged in a single row, in the latter in a double row. The cost of construction per cow accommodated is less for a double than for a single byre, since, in the case of a double byre, one central passage serves both rows of cows.

Double cow-byres may be arranged as follows with

(*a*) One central combined cleaning, milking, and feeding passage, the cows standing with their heads to the side walls, as shown in fig. 1; or

(*b*) one central cleaning and milking passage, and two feeding passages, one along each side wall. The animals stand in two rows back to back (see fig. 2); or

(*c*) one central feeding passage and two cleaning and milking passages, one along each side wall. The animals stand in two rows head to head. For reasons to be stated later, this is not a desirable arrangement.

In designing a byre, the following objects should be kept in view:

(1) *Cleanliness* is essential from the point of view of the health of the cows, as well as the purity of the milk produced.

Milking and cleaning passages should not be less than 4 ft. 6 in. wide for single byres, and 6 ft. for double byres.

In the climate of this country cows can, all the year round, be taken outside for watering purposes; no elaborate system of water service to each stall is therefore necessary, though, if circumstances permit, it is probably desirable.

A service of water to one end of the byre for cleaning purposes is convenient if it can be arranged for. The walls of a cow-byre should be limewashed at least twice a year, in order to cleanse them and destroy the germs of disease.

(2) *Ventilation and Air-Space.*—Ventilation will be amply provided for if the roof be left open along the eaves, and also at the ridge, as shown in fig. 1, where the air-space at the eaves, between the top of the side wall and the corrugated-iron roof-covering, averages 2½ inches in width, and the opening along the ridge is 18 inches wide, protected by a raised covered ridge cap.

All windows should be capable of being opened over their whole area. They should preferably be hinged along their lower edges in such a way as to open inwards, they will then, when open, tend to deflect the entering air upwards.

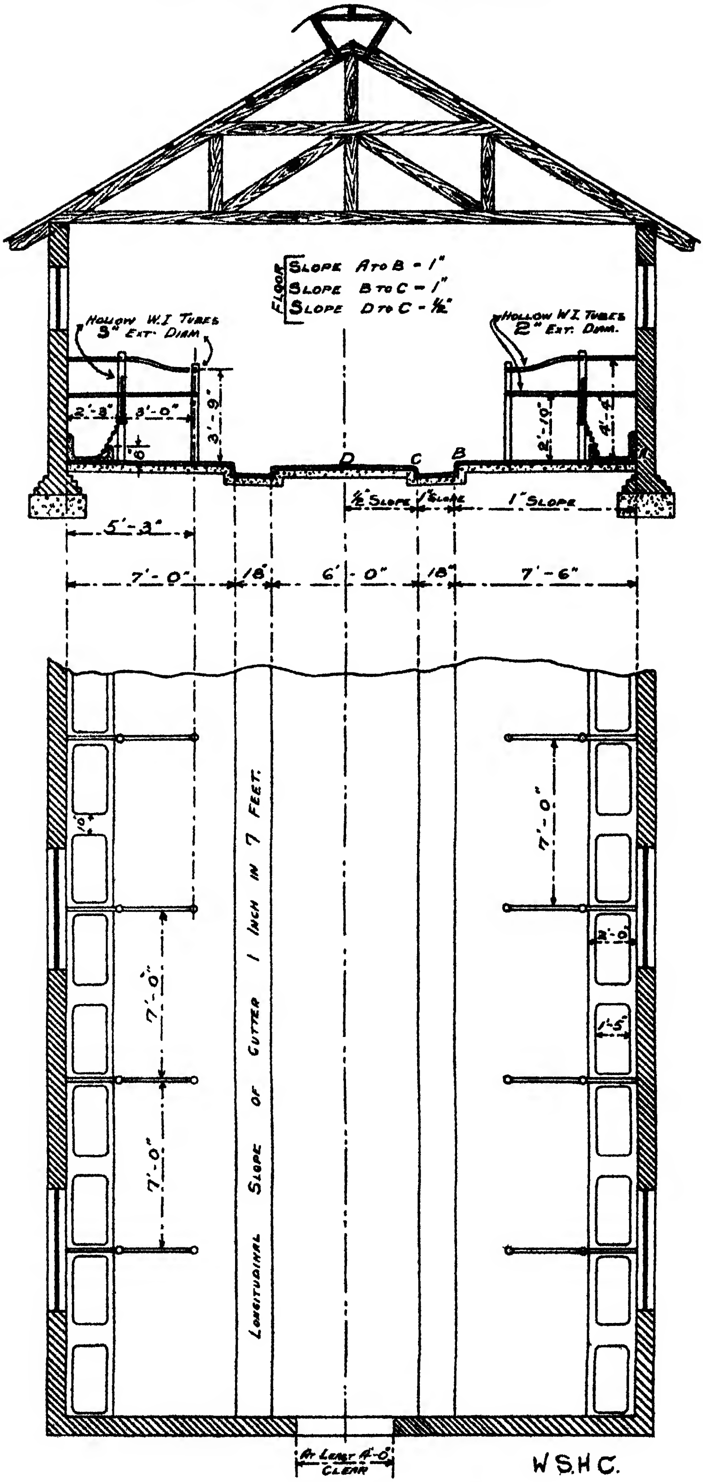


Fig. 1. Scale: ⅛ inch = 1 foot.

Closely connected with the subject of ventilation is that of the cubic air-space to be allowed.

According to the size of the breed, cows should be allowed from 500 to 700 cubic feet per head, but good ventilation and good air circulation throughout the building is probably of greater importance than cubic air-space.

(3) *Lighting.*—Sunlight is an excellent germicide, and should therefore be freely admitted, 2 or 3 square feet of lighting area being allowed as a minimum to each animal. As mentioned under "Ventilation", the windows should be made to open over their whole area in order to supplement the ventilation, especially in hot weather. If the animals are stalled with their heads to the wall, the bottoms of the windows should be from 5 to 6 feet above the floor, but if a passage intervenes between the cows' heads and the wall, the windows may be a little lower.

(4) *Comfort and Health of Cows.*—Throughout the design, the comfort of the animals should be kept well in view. The more comfortable a cow is kept, the better results will she give at the pail.

With regard to the health of the animals, it may be well to point out that double cow-byres are sometimes arranged so that the animals stand head to head, with a feeding passage down the middle, and a cleaning and milking passage down each side of the byre. This arrangement cannot be recommended for the reason that the foul air from the lungs of the animals is concentrated at the middle of the byre and breathed by the different animals. Thus one infected animal may quickly and easily infect its neighbours. Other objections to this arrangement are that the animals' heads are as far removed from the fresh air inlets as possible, and that there are two passages for the removal of manure to be kept clean, whereas there is only one when the animals stand back to back.

(5) *Economy of Labour.*—In these days when labour is scarce and generally unsatisfactory, it is more than ever important that the work of feeding and cleaning should be reduced to a minimum by correct internal design, and also by situating the byre in a convenient position with regard to food stores, manure heap, etc. In this connection may be mentioned overhead feed, litter and manure carriers, now found all over Canada and the United States, which save an immense amount of labour. The general arrangement of such a carrier gear is illustrated in fig. 3. The carrier is self-emptying, and, if the rail be laid with a slight slope towards the dungstead, may be run out and will empty automatically by the action of the trip stop, T.S. (which may be placed at any desired point on the line), on the trigger T, as shown in figs. 4 and 5. After emptying, the carrier may be pulled back by means of an attached rope, the end of which has been retained in the hand. The better types of carrier are also provided with a raising and lowering gear, so that they may be lowered to the floor when required for purposes of filling or emptying.

Keeping in view the above objects, the following points remain for consideration:—

Site.—The site will probably be determined by the disposition of the other buildings of the homestead. If possible, it should be dry and moderately high, and should be conveniently placed with regard to the other buildings, and as regards the supply of fodder, the removal of manure, etc., the byre should also be placed so that the

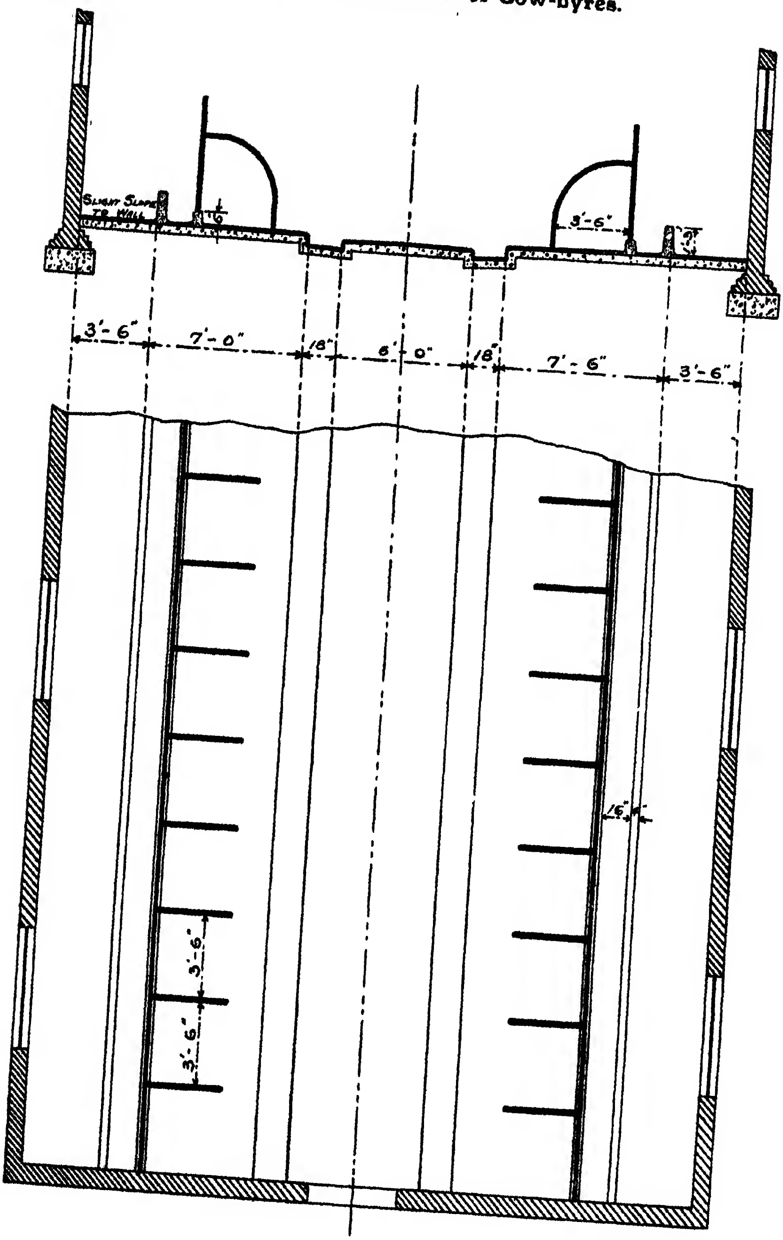


Fig. 2. Scale · ⅛ inch = 1 foot.

W. S. H. C.

cattle can have easy access to the nearest pasture without opportunities for straying or interfering with other stock. The byre should, if possible, be sheltered from cold winds. A site possessing a gentle slope assists in drainage.

The Walls.—These may be of stone, brick, concrete, wood, or wood and iron, according to the material most cheaply available in the district concerned. The last two are not so durable as the first three, and a wood and iron building is a bad heat insulator, i.e. is hot in summer and cold in winter. If of stone, the external walls should be 20 inches thick, and the inside walls, if any, from 15 to 18 inches thick, the stones being laid on their natural bed, i.e. with the laminations horizontal.

If of brick, the walls should be at least one brick or 9 inches thick. All sharp corners of doors, etc., should be rounded off to prevent animals injuring themselves.

If of stone or brick, the outer side of the walls should be well pointed, or, if of brick of poor quality, protected by lime or cement plaster. The inner side of the walls should be covered with a layer of plaster, cement plaster being used up to a height of 6 feet above the floor, on account of its superior strength to resist breakage by knocks from animals' horns, etc.

The life of a wood or wood and iron building will be at least doubled by using creosoted timber for all uprights and sills.

If animals are stalled heads to wall in an iron building, their breath condenses on and runs down the walls in cold weather. This may be prevented and the comfort and warmth of the animals increased if the inside of the wall be close boarded to a height of 4 ft. 6 in. above the floor. One-inch deal boards may be used for this purpose.

The Roof.—For reasons of cost, in this country the roof would probably be of corrugated iron. This material, as before mentioned, has the fault of being a bad heat insulator. Thatching is much better in this respect, but it is not to be recommended on account of the difficulty of thoroughly disinfecting such a roof after an outbreak of infectious disease, since it cannot be whitewashed or sprayed effectively. Further, the use of thatching appreciably increases the risk of fire, a matter of great importance when valuable animals are housed.

The roof illustrated in fig. 1 is of substantial construction. The horizontal members (ties) are double, each consisting of two boards 6 in. wide by 1¼ in. thick. The remaining members of the roof truss are all 6 in. wide by 1½ in. in section. The purlins are 3 in. by 2½ in., the larger dimensions being parallel to the rafters; the wall plates are 4 in. by 2½ in., the larger dimension being horizontal. The roof trusses are spaced about 5 ft. 6 in. apart.

The Floor.—A perfect floor would be

(*a*) impervious to moisture and non-absorbent;
(*b*) not too cold or damp;
(*c*) not slippery;
(*d*) of uniform hard wearing material which will not wear into hollows;
(*e*) easily cleaned.

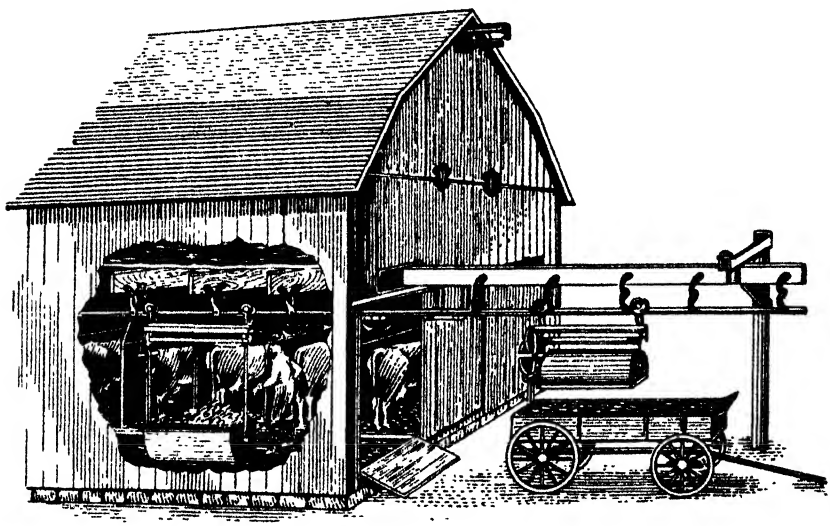
No material fulfils all these conditions; we have a choice of the following:—Cement-concrete, asphalte, granolithic, hard blue bricks. Ordinary bricks are too absorbent, and the floor soon wears into hollows if they be used. Hard blue bricks may be used if easily obtainable,

and if suitable sand cannot be got for the purpose of making concrete, the joints between the bricks should be thoroughly cemented.

Good cement concrete, well laid and finished, forms probably as good a floor as can be got, if clean, sharp sand and gravel are obtainable for use in making the concrete. To prevent slipping the surface of the floor should be scored with V grooves, ½ in. deep, from 4 to 5 in. apart.

When blue bricks are used for the floor the bottoms and sides of the manure channels should be finished with a layer of cement or granolithic.

The front part of the stalls, to a distance of about 3 ft. 6 in. from the manger, may with advantage be laid with asphalte, clay, or ant-heap; this conduces to the comfort and warmth of the animals while lying down.



If the number of double stalls in the length of a byre exceeds ten (or twenty single stalls), the provision of doors in the side walls, beyond the usual doors in the end walls, will be found to add greatly to cleanliness and ease of working.

Drainage.—No covered drains should be permitted inside cow-byres, as they are more difficult to keep clean than the open variety, besides which, the dirt in closed drains is out of sight, and that in most cases means "out of mind" as well.

The open cow-byre gutters should discharge into a trap *outside* the byre, from which a drain pipe, which should be as straight and short as possible, leads to the dungstead. This drain pipe line should have a steep gradient, and, if it cannot be made straight, should be provided with a manhole at each bend; and even in a straight length, if at all long, manholes should be provided at intervals.

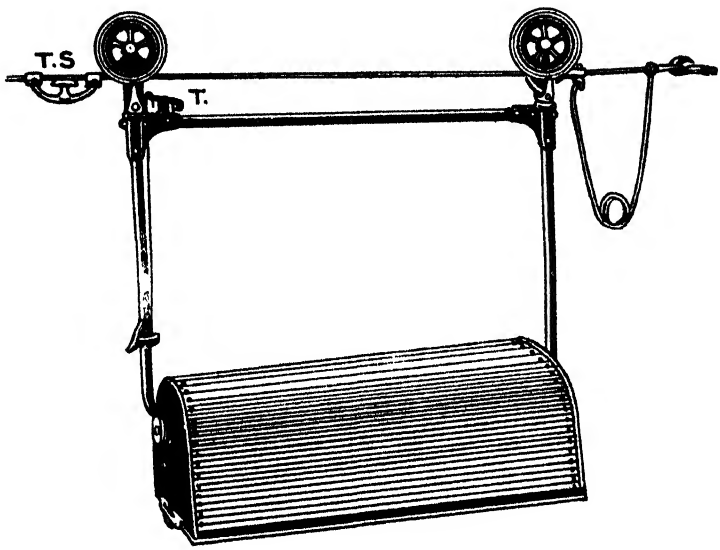
The urine and washings from this drain can be run into a tank close to the dung-heap, from which they may be pumped as desired, either over the land or over the manure-heap. The urine, as a rule,

will be sufficiently diluted for use for irrigation purposes by the water used in washing out the byre.

The only satisfactory type of pump for pumping urine is one consisting of a number of cast-iron discs fixed to an endless chain. These discs pass upward through the delivery pipe carrying with them the liquid to be elevated. Being of cast-iron, they resist corrosion better than wrought-iron or steel, and when they do corrode they can be easily and cheaply replaced.

Internal Design.—The chief points which require attention in the internal design are

(*a*) facility in cleaning and feeding;
(*b*) the reduction to a minimum of the risk of contamination of the milk produced;
(*c*) the health and comfort of the animals.



Manger.—It is quite a mistake, but one which is often made, to place the manger above the floor level. With the manger so raised, the following is what happens:—When feeding, the cow has her head over the manger, but before she can lie down she has to step back so that her head may clear the high manger. The length of the stall from manger to manure gutter has to be made long enough to suit this second position, and is consequently too long for the first position. The droppings of the cow when she is feeding then fall on the place where her hindquarters will be when she steps back and lies down. It is therefore quite impossible to keep the cows clean when provided with high mangers. The great secret in building stalls is to arrange them so that the cow lies down in the same floor space as that which she occupies when feeding. This can only be done by building the manger on the floor level, and with its edge next the cow of such a height that she can comfortably rest her head over the manger when lying down (see figs. 1, 2, and 6). In the case of double stalls the space between

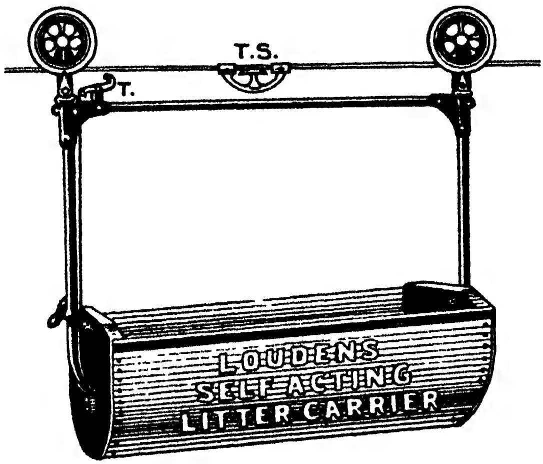
the two feeding troughs should be filled with brick to prevent one cow stealing food from another (see fig. 1), and the corners inside the troughs should be well rounded in with cement to facilitate cleaning.

Glazed fire-clay is a good material for mangers.

Stalls.—The length of the stalls will vary according to the size of the cows to be accommodated, as follows:—

Jerseys and Kerrys, 6 ft. 6 in. to 7 ft.
Ayrshires, 7 ft.
Cross-bred cows of average size, 7 ft. to 7 ft. 6 in.
Shorthorns, Fries, etc., 7 ft. 6 in. to 8 ft.

The above lengths are from outside wall of manger to side of gutter next cow's heels, i.e. they include the width of the manger.



For smaller sized cows each double stall should be 6 ft. 6 in. wide, and for larger cows 7 ft. to 7 ft. 6 in. wide.

If stalls are made too short the cows stand with their hind feet in the manure channel, and if too long they drop their dung on the stall floor, and later on lie down in it.

It is convenient to have the stalls on one side of a double cow-house of a slightly different length from those on the other side, so that the larger cows may be stalled on one side of the byre and the smaller cows on the other side. This arrangement is illustrated by fig. 1.

The stalls should have a slope of about 1 inch towards the gutter.

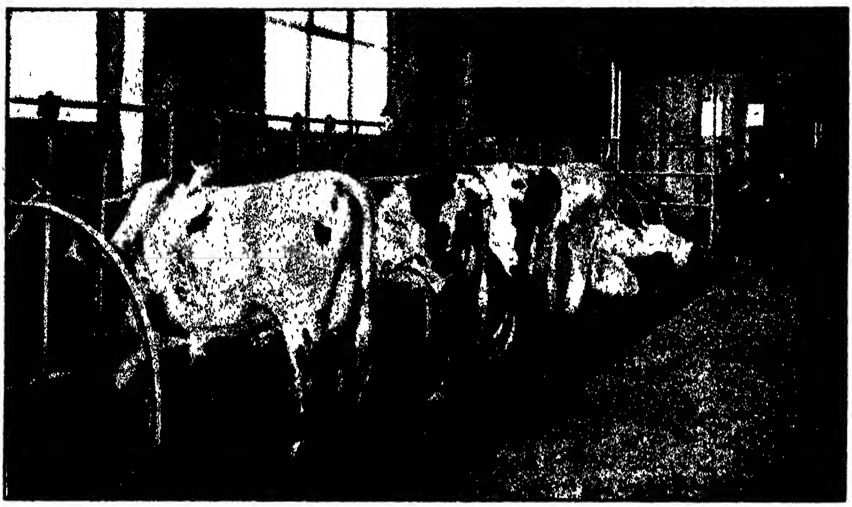
Stall Divisions.—These may be from 5 ft. to 5 ft. 6 in. long by from 4 ft. to 4 ft. 6 in. high for the type of stall shown in fig. 1, which illustrates a serviceable type of stall division constructed of iron tubes. If desired, these divisions may be made close by screwing on to each a single thickness of sheet-iron.

A slab of cement 3 inches thick forms a strong, neat, and serviceable division which saves painting, periodic washing with water or limewashing sufficing to keep it clean.

The cow may be fastened in her stall by means of a bar of iron about 2 feet long, attached vertically to the side of the stall division, about 2 inches in front of the manger. A swivel, carrying a short length of chain with a ring at the end, slides up and down this bar. The cow is fastened by the neck to the ring by means of a cow chain.

The American and Canadian method of fastening cows in their stalls is to use stanchions, which form a sort of collar round the cow's neck, and which ensure that she shall lie with her head over the manger. The stanchious are fastened to the stall frame at the top and bottom, by short lengths of chain, which allow a certain amount of play. The arrangement is shown in figs. 2 and 6. Fig. 7 illustrates an elaborate American byre fitted with these stanchions, litter carriers, etc.

Manure Channels.—Manure channels should be not less than 18 in. wide, though, if the extra expense is no object, they may with advantage be made 24 in. wide. The advantage of a wide gutter lies



in its lessened likelihood of being blocked by solid excreta, forming pools of urine into which the cow's tail is apt to hang every time she lies down. The manure channel should not be less than 6 in. deep at the cow's heels, and 4 in. deep at the side next the passage, and should have a fall lengthwise of 1 in. for every double stall, i.e. 1 in. in 7 ft.

The Dutch in Holland use a very deep manure channel, from 18 to 20 in. deep. This prevents the cows from standing back in the gutter, though it necessitates the use of a temporary bridge to enable the cows to get across. In this connection it may be interesting to mention that the Hollander ties up his cow's tail by means of a strap and cord, so that when she lies down it cannot hang into the gutter.

CONCRETE AND PLASTER WORK.

Concrete Floor.—To make a concrete floor, the ground should first be approximately levelled, it being permissible to fill the larger hollows with broken stone or brick, but no vegetable or other perishable matter

should be used for this purpose. The ground, while being levelled, should also be rammed hard. Next a 4-in. layer of concrete should be laid, being tipped from a height of about 2 ft., and well rammed with hand beaters. This layer should consist of the following proportions of materials by bulk when dry.—1 part portland cement, 3 parts of clean, sharp sand, 6 parts of shingle or broken stone.

Before the above concrete has set, it should be covered with a layer, from 1 to $1\frac{1}{2}$ inches thick, consisting of equal parts by bulk of cement, sand, and broken stone, the latter being fine enough to pass through a $\frac{3}{8}$-in. mesh.

In order to roughen the floor, and render it non-slippery, the surface of this upper layer should be brushed over with a stiff brush

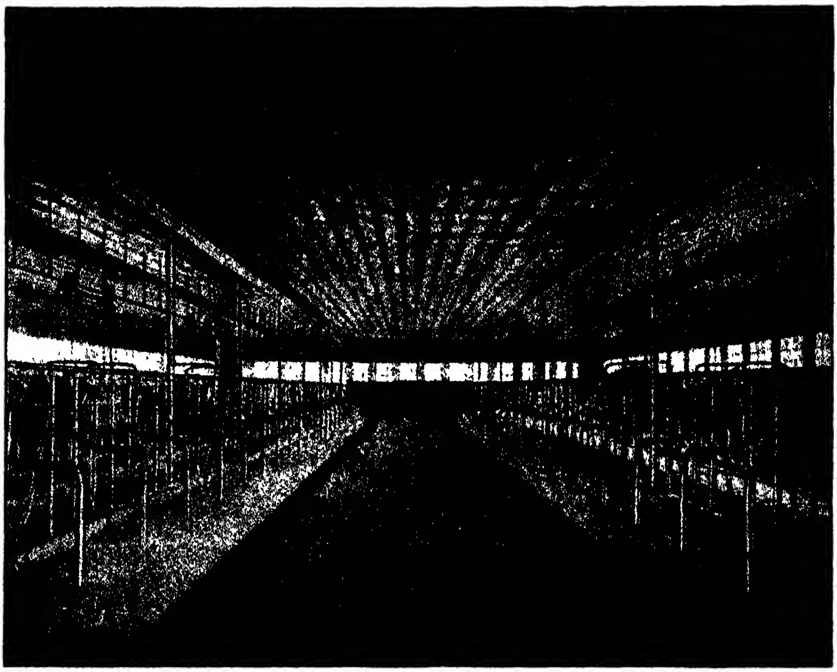


Fig 7

before it has quite set, in addition to the V grooves already mentioned being formed.

Granolithic Floor.—For very high-class work, the above floor may be floated over with a mixture of equal parts of cement and red oxide of lead to an average depth of $\frac{1}{4}$ inch.

Blue Brick Floor.—The ground having been rammed and levelled as before, put down a 3-in. layer of 1 part cement, 3 parts clean, sharp sand, and 6 parts shingle or broken stone. The bricks are laid on the top of this layer of concrete, the joints breaking lap, and being well cemented.

Asphalte Floor.—As before mentioned, an asphalte floor may, with advantage, be used for the front part of the stalls. It may consist of a 3-in. layer of concrete in the proportions of 1 cement, 3

sand, 6 shingle or broken stone. This is topped by a $\frac{3}{8}$-in. layer of asphalte.

Plastering.—The mortar joints of the walls should be raked out to a depth of about $\frac{3}{4}$ in. to form a key for the plaster, before applying which, the brickwork should be thoroughly wetted. The thickness of the layer of plaster may be $\frac{1}{2}$ in. for inside work and $\frac{3}{4}$ in. for outside work.

Lime plaster consists of 1 part lime to 3 parts clean, sharp sand.

Cement plaster consists of 1 part cement to 3 parts clean, sharp sand.

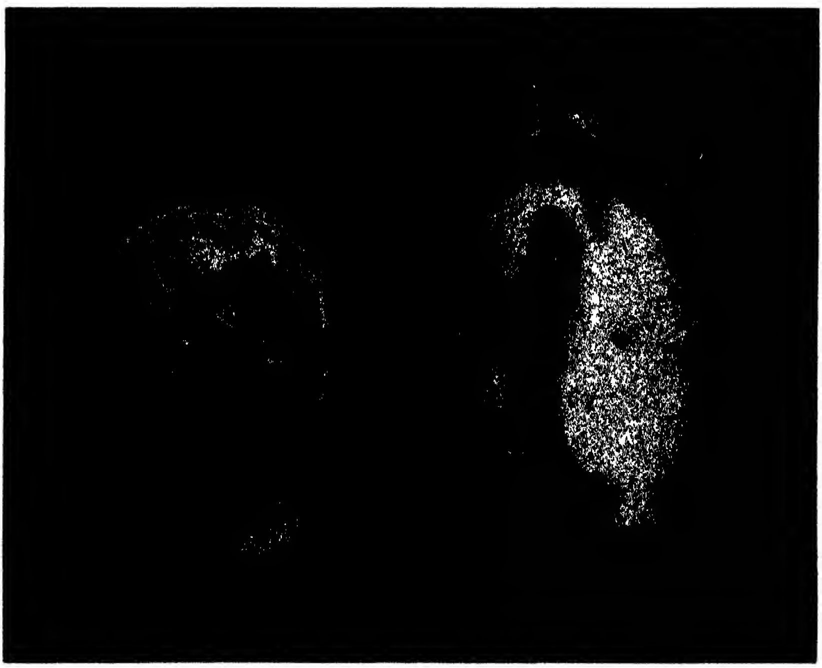
Acknowledgment.—The author desires to gratefully acknowledge the help rendered him by Mr. Alex. Holm, who supplied many valuable suggestions during the writing of this paper.

Figs. 3, 4, 5, 6, and 7 are taken from the catalogues of the Louden Machinery Company, Fairfield, Iowa, United States America.

The Potato Tuber Moth and its Control.

By W. MOORE, B.A., Lecturer in Entomology, Experimental Farm, Potchefstroom.

Introduction.—The most serious insect pest of the potato in South Africa is the potato tuber moth. The damage done by this moth is often very great; especially is this true of the crop of potatoes now in the ground. The crop of potatoes raised on the Experimental Farm, Potchefstroom, in 1910 was infested to the extent of 60 to 80 per cent. when they were taken out of the ground. As the larva or grub of this moth is very difficult to kill once it has entered the potato,



Infested Tubers.

experiments were planned to discover the best way to prevent the potato from becoming infested. These were carried out in the 1911 season.

Description and Life History.—It might be well first to briefly describe the different stages of the moth and give a few notes as to its life history. The adult moth is about ⅝ of an inch across the expanded wings; at rest with the wings folded over the body it is about ⅜ of an inch in length. The colour is greyish brown with obscure darker markings. The hind wings which are hidden when at rest are nearly white in colour and fringed with long hairs. The

eggs are laid on the leaves of the potato vine and the larvae burrow in the leaves or sometimes down through the vine itself. Often several leaves are fastened together and the larva feeds in between these leaves. The larva when full grown is about ½ inch in length and of a dirty white colour with a pink or a greenish tint. The pupa is light brown, and is covered by a very light silken cocoon which is generally coated with particles of dirt or debris. The tubers of the early crop of potatoes are seldom attacked, as they are generally taken up while the vines are still green and the larvae are able to feed upon them. In the case of the last crop of potatoes, the vines are generally cut down by frost and the potatoes are left in the field through the winter as they keep better under such conditions. When the vines are thus frosted they soon dry up and no longer furnish food for the larvae of the moth. There are also a number of moths in the field which then will lay their eggs on any potato tubers which may be exposed. It is also claimed by some authors that should the soil be cracked the moths will work their way down through these cracks into the soil and lay their eggs on the tubers in the ground. The eggs are laid in the eye of the potato, and the newly hatched larvae eat their way into the tubers, sometimes working their way into the heart of the potato, while at other times they make their burrow just underneath the skin. Badly infested tubers are thus rendered unfit for seed as the eyes are destroyed. When the vines are cut down by frost the larvae in the vines leave them and no doubt burrow into the ground and enter the tuber found there. This has not been definitely proven to take place in South Africa, but it is reported to be the case in Tasmania.

Experiments.—The two methods mentioned above seem to be the only sources of infestation of the tubers while still in the soil. Careful compact "hilling" is claimed by Mr. Lounsbury to prevent the larvae or moths gaining access to the potato tubers. The experiments carried out in 1911 were to find out exactly how carefully this had to be done. The potatoes were planted with a space of 3 feet between the rows in order to give room for careful hilling up of the rows. Six rows were not hilled up at all during the season. The rest of the rows were carefully hilled up all through the season, so that at least 3 or 4 inches of soil covered the tubers. When the frost destroyed the vines they were all pulled out, except four rows which were left as a check. The vines were piled up and burned as soon as possible. The object of this measure was to destroy all larvae in the vines before they had a chance to leave the vines and burrow down to the tubers. After the vines were removed it was found that the soil was more or less cracked and broken by the pulling up of the vines, so that it seemed necessary to hill them once more. This was done on all the rows except about six or eight which were left as a check. It might be mentioned that in the field many moths were flying at this time.

The field was left then until the spring when the potatoes were taken out. At this time few moths were found in the field. As the moths will lay their eggs on the tubers, when they are exposed at the time they are taken out, it is clear that the spring conditions were more favourable than when the frost killed the vines and the field was full of moths. The potatoes should never be left in the field longer than necessary, and never left until sundown or overnight. When the potatoes were brought in the different lots were examined (about 1000 tubers from each lot) to determine the percentage of infestation.

The results were:—

1. Rows not hilled at any time during season, 15 per cent. infested.
2. Rows hilled during growing season but vines not pulled, 8 per cent. infested.
3. Rows hilled during growing season but not hilled after the vines were pulled, 14 per cent. infested.
4. Rows hilled during growing season, the vines pulled out and re-hilled, 7 per cent. infested.

The results show a very small difference between the rows which did not have the vines pulled and those which had the vines pulled and had been re-hilled afterwards. This would show that if the rows are well hilled up few larvae in the vines at the time they are killed by frost will find their way to the tubers underground.

The results from the rows which had been hilled all through the growing season, but had not been re-hilled after the vines were pulled, show that many of the moths, no doubt, found the tubers exposed by the pulling of the vines.

Further experiments will be carried out this year to ascertain whether the expense of pulling the vines will be warranted by the results obtained. From the results it would appear that if the rows are hilled up so that at least 3 or 4 inches of soil cover the tubers, the infestation in the field will not be great.

When the potatoes are brought in they should be carefully sorted to remove infested tubers, and the sound tubers stored in a room free from the tuber moth. The infested tubers should be immediately destroyed. Mr. Fuller recommends treating the potatoes with a solution of corrosive sublimate before storing them to prevent further attack. Two ounces of corrosive sublimate is dissolved in 2 gallons of boiling water and then diluted to 15 gallons. The potatoes should be soaked for 1½ hours. This should not be used for eating potatoes, as corrosive sublimate is very poisonous. However, it will not injure the potatoes for planting purposes.

How to Raise Trees from Seed.

By G. A. Wilmot, District Forest Officer, Tokai.

Farmers and others frequently write for information as to how they should proceed to raise their own trees from seed. The following short notes may be of some use to those who wish to save the expense of purchasing trees:—

1. As far as possible endeavour to obtain fresh seed, that is, seed not more than a year old. In the case of wattles and pines this is not so important as these species retain their fertility for a long time, especially wattles (acacias).

2. The best time to sow is in the early spring, that is, towards the end of July or beginning of August.

3. The soil should be finely sifted and mixed with a very little sifted old stable manure. The proportion might be about one manure to ten fresh garden soil. This mixture can be put in half paraffin tins or boxes, taking care that the tins are well drained. For this purpose holes are cut in the tins and a few stones scattered at the bottom before the soil is placed in the tins.

4. The seed should be evenly scattered on top of the soil and lightly pressed down with a small piece of board. A little light sand can then be scattered over the seed so that it is just covered.

5. The seed tins must be watered every evening with a fine rose so as not to disturb the seed or wash it to the side of the tin.

6. The seed tins must be covered with some kind of shade to keep the soil just moist and prevent caking. This can be done with reeds, long grass, or any suitable material.

7. When the seed begins to germinate the shade can be raised above the tins and gradually reduced from day to day as the seedlings become stronger. In about two weeks after germination all the shade can be taken off.

8. The length of time before germination takes place varies with different seeds. Some take three to six weeks, such as gums and pines. Others take longer and germinate very irregularly. The seed of pencil cedar, for instance, may take more than a year to germinate.

9. When the small seedlings are strong and are commencing to throw out side rootlets it is time to "prick them out". This will usually be about three to five weeks after germination.

10. Fresh soil with manure is again prepared in tins in the same way as for sowing. The seedlings are "pricked out" or transplanted in these tins, putting twenty-five or thirty seedlings in a tin in even rows. This is quickly done by means of a wooden dibble by which a hole is pressed into the soil and the dibble withdrawn. The rootlets of the seedlings are carefully let into this hole and the soil firmly pressed about the rootlets again.

11. The transplants must be kept in full shade for six to eight days after being pricked out and then under partial shade for a similar

period. Full shade would be under the shade of large trees, and partial shade under some sort of a trellis work through which more light filters.

12. For the first three weeks after pricking out the young plants require to be watered every evening; later on, and according to the weather, the plants can gradually be hardened by watering only every second day But precaution must be taken that the moisture in the tins does not altogether dry out.

13. In four to six months after pricking out the transplants will be fit to plant out in the open. If the season for planting out at that time is not opportune the transplants can be kept five or six months longer in the tins.

14. If the plants are kept a long time in the tins it will be necessary to scrape off the roots which grow through the drainage holes at the bottom of the tin to prevent their taking root in the ground, and also to produce a better root system on the plant itself.

15. In the case of hard coated seeds, such as the wattles, the seed must be soaked in hot water for twenty-four to thirty-six hours before sowing.

Covent Garden Market Notes.

By R. A. Davis, Government Horticulturist (Transvaal).

An article under the above heading appeared in the December number of this *Journal*, the concluding paragraphs of which touched upon the lack of a system of distribution of South African fresh fruit in England.

The attention of the writer has been called to the fact that a system of distribution which accords very nearly with his views on this subject is actually in existence.

A well-known firm has been established in Southampton for some four or five years past and is forwarding fruit consigned to them to such markets as may appear most favourable; they use their judgment and discrimination, and instead of dumping everything on the London market seek out for their clients other openings which appear to them to offer better opportunities for the profitable handling of their products. It is the writer's duty therefore to tender an apology to the firm in question and to congratulate them on having installed a system of business which is bound to be a successful one.

In the consideration of dealing with large masses of fruit, comparatively small outlets are apt to be overlooked, and this is just what occurred when the previous notes were written.

But while one firm carries on business on the lines mentioned, the vast bulk of South African fruit is consigned to London direct and there disposed of either by auction or by private dealers, and it is here that "gluts", such as one reads of too frequently during the deciduous fruit season, occur. It is quite true that the Covent Garden Market and dealers handle immense quantities of fruit and probably will always remain the leading centres of the fresh fruit trade, but even the capacities of this market, great as they are and with a multiplicity of outlets, can be and occasionally are over-estimated.

It appears to the writer that an association, which might well be termed the South African Fruit Exporters' Association, and which should embrace every branch of the fruit industry, would be a desideratum, but no one is better aware that the formation of such an association should be a spontaneous one, if any practical good is to result.

Two Fungous Diseases of Coniferous Trees.

By JOHN FISHER, B.Sc., N.D.A. (Hons.), Biologist, Agricultural College, Cedara (Natal).

THE work of afforestation in South Africa is meeting with a considerable number of difficulties. Besides the risks from insect attacks and veld fires, another and more serious risk is due to the attack of fungi. The last is the most difficult to guard against, for the vegetative part of the mycelium may be present in young trees which are being transplanted without there being any external evidence of it. When such young trees are transplanted the fungus grows along with the trees, finally destroying them.

Fungal diseases may also be carried from one place to another by their reproductive bodies or spores being adherent to the seeds, and affecting the young trees as they begin to grow.

Spores are also carried by the wind for considerable distances, and from a single infected tree in a plantation the disease may spread outwards in all directions.

Early in the month of January species of pine at the Central Experiment Farm, Natal, were noticed to be in a sickly condition, and it was observed that a number of both terminal and lateral shoots were dying. At first this was thought to be due to hail, as several severe storms have been experienced this season. The spread of the disease caused a more careful examination to be made of the dead shoots, with the result that the injury was found to be of fungal origin. The disease is caused by the fungus *Diplodia pinea*, Kickx.

Symptoms of Attack.—The terminal shoots fail to make their proper growth. They remain stunted and the needles do not attain their proper development. The needles then turn brown, the shoot shrinks, and the needles fall away. Some needles remain, but become very dry and brittle and fall away on being touched. The shoot often bends over and becomes very brittle. In many cases there is also an exudation of resin, which appears as a white excrescence on the shoot. On the shoots which have become shrivelled and on the needles may be seen small black specks. These are the fruiting bodies of the fungus, and each is composed of a large number of spores. The accompanying diagram will show the general characters of the disease.

The fungus appears to confine its attention to the genus *Pinus*. Trees belonging to the genera *Cupressus, Cedrus, Casuarina,* growing alongside diseased pines, were not affected.

Whilst investigating the distribution of the above disease, another and somewhat similar disease was discovered both on conifers and also on the genus *Casuarina*.

The symptoms of attack are not, in general, unlike those caused by *Diplodia pinea*. When the trees are attacked the needles or leaves are not shed to such an extent as in the above case, but turn a sickly yellow colour and the affected part gradually dies.

This condition is due to the attack of the fungus *Pestalozzia funerea*, Desm.

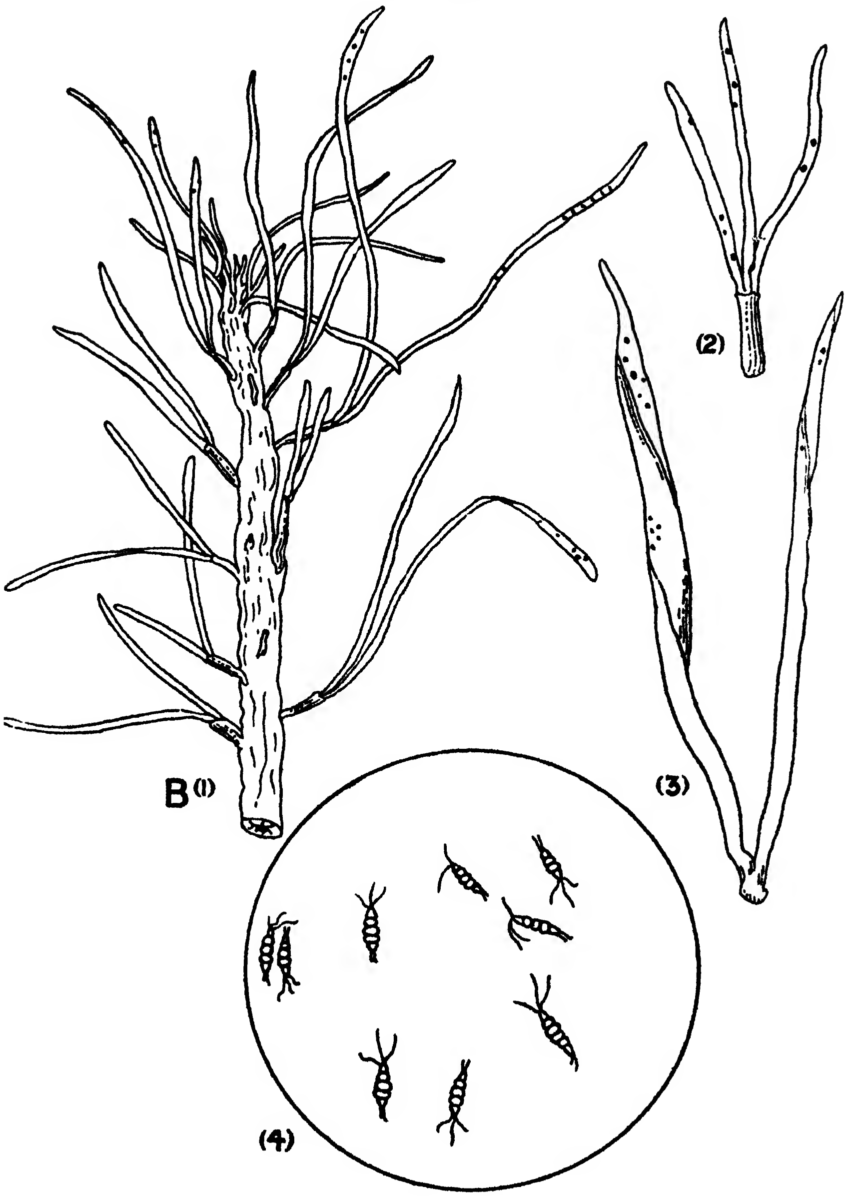
This disease has been noticed on *Pinus pinaster*, *P. canariensis*, *P. longifolia*, *P. insignis*, *P. massoniana*, on *Cupressus lusitanica*, *C. lawsoniana*, and on *Casuarina leptoclada*. A tree of *Callitris australis* in a dying condition was noticed near *P. pinaster* suffering from this disease, but the reproductive bodies were not observable upon it.

A. Fig. 1. Shows a diseased shoot of *Pinus pinaster*. Fig. 2. Needles from the apex of the diseased shoot with the black fruiting bodies of the fungus. Fig. 3. Shows the fruiting bodies (conidia) highly magnified. One conidium is beginning to grow.

Remedial Measures.—Nursery stock should be free from any disease before transplanting. The removal of small diseased branches in young trees might prevent the death of the tree, but there is always the danger of the disease spreading and affecting large forestal areas when remedial measures are useless.

The removal and burning of diseased trees as soon as the disease is noticed is the only way to combat the disease.

Trees which suffer from the disease should not be again planted in diseased ground, and proximity of plantations of trees liable to be attacked should be avoided when transplanting.



B. Fig. 1. Shows a diseased shoot of *Pinus pinaster.* Fig. 2. Shows needles of *Pinus canariensis* with the black fruiting spots. Fig. 3. Shows needles of *P. pinaster* enlarged. Fig. 4. Shows the conidia of the fungus.

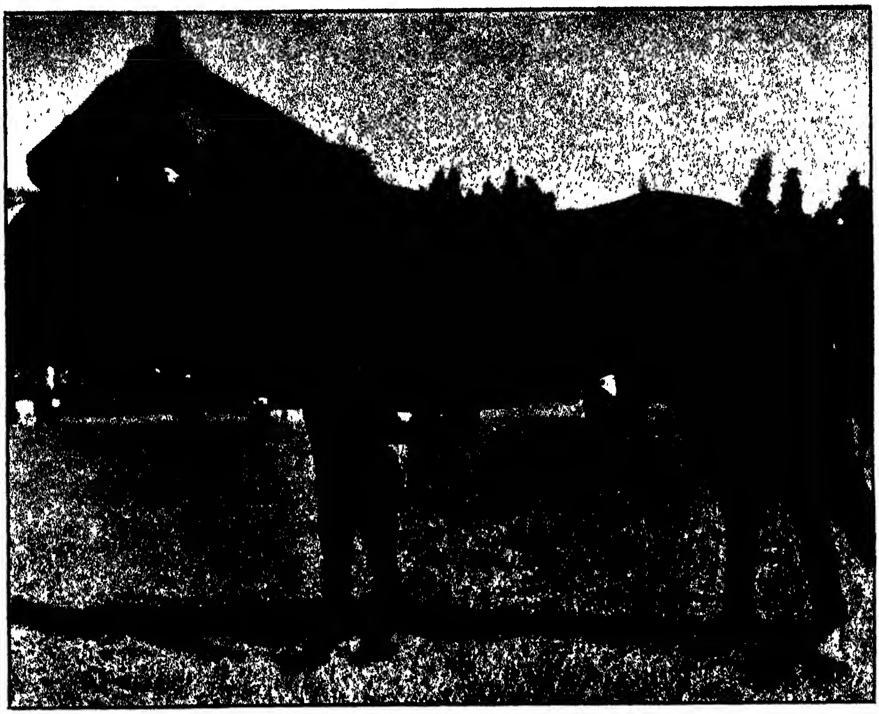
Both the above diseases are favoured in their spread by wounds, so that care should be exercised when handling lest the young trees are damaged. Continuous wet weather, accompanied by severe hailstorms, have undoubtedly aggravated both of the above diseases.

The Agricultural Show Season, 1912.

THE Agricultural Show Season for 1912 has opened most favourably with the usual Western Province series. The indications may be taken as showing very sound advances in most of the cultural industries of the sections interested, which is a good sign in itself, while there are many features on some of the local shows which give hope of further extensions. The most prominent features of agricultural activity in the western districts of the Cape all show a tendency to break away from tradition wherever it is possible to do so, and this tendency should be encouraged as far as is compatible with sound farming. In the sections referred to the enormous wealth in cereals which is annually produced has ever carried with it a tendency to reduce the fertility of soils which are not naturally over-rich in plant food. Unfortunately the constant cropping with cereals has compelled recourse to fertilizers of varying qualities and efficacy, and as the great bulk of the crops are sold out this means a constant drain on the land as well as the farmers' pocket. The obvious remedy is stock, and more stock—a doctrine which has been insistently forced upon the people for many years past both by precept and practice. Yet until quite recently—that is comparatively speaking—the stocking of these districts proceeded very slowly. So slowly has this really natural process advanced that creameries established with Government funds have languished and died for lack of support. There is great hope, however, for the future, and this hope is strongly foreshadowed in the recent shows. "Stock, and more stock" should be the watchword, and in accordance with this great and sound precept the day should not be far distant when the local showyards of the Western Province will be crowded with farm animals of the most useful and valuable description.

PAARL, THE FIRST SHOW OF THE YEAR,

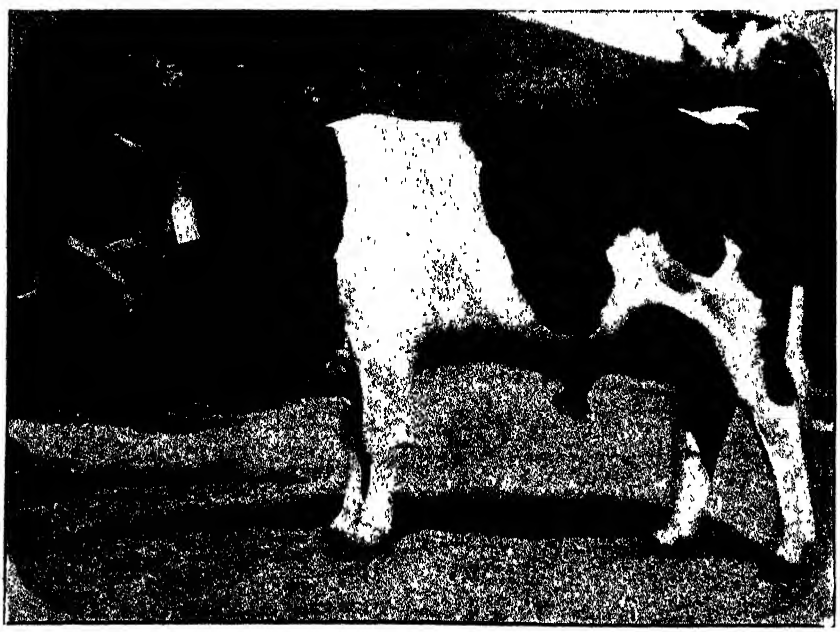
set an excellent lead. For a purely local competition it was quite good. The fruit, the grapes, the local industries, were all anticipated, but it was in the stock lines where the real industrial value of the show was exhibited. Paarl is noted for its viticulture, and is probably one of the most important vine-growing sections in the Union. But it is also a great grain-producing district, and though its lengthy dry summers handicap it for grazing purposes somewhat, there is no reason why its great oat crops should not be turned to greater profit by feeding it to farm animals instead of selling it off the farm. There are always means for overcoming difficulties, and these are evidently being found by the Paarl farmers in their steady advance towards better things. Their stock is increasing and the quality is improving. In cattle and horses they put up an exhibit that was most creditable, and it was put forward in a manner that shows the direction of their ambitions. They evidently realize



PAARL.—Messrs. P. & A. P. Brier's First Prize Thoroughbred Stallion "Flying Prince'

PAARL.—First Prize Span of Mules.

PAARL.—Mr. D. J. Schneider's First Prize Colonial Friesland Bull.



PAARL.—Mr. J. C. Myburgh's First Prize Colonial Dutch Bull.

the necessity of "stock, and more stock" for the better working of their farms, and it is to be hoped this spirit will be maintained.

The season has been a very trying one for the farmers of the Cape Western Province. Late rains, heat, and destructive winds have worked havoc with the fruit and vines. So great was the damage on some farms that its assessed value ran into many hundreds of pounds. For all that the fruits of all description shown were excellent, though the quantity exhibited was a little less than last year.

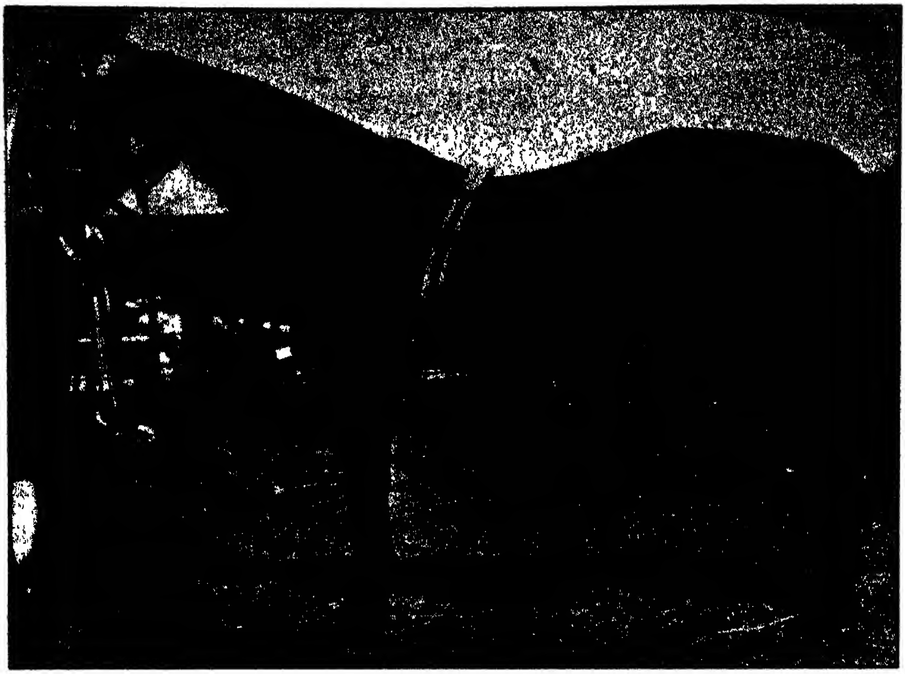
The stock exhibits included some really fine horses of various type—from lights to heavies—while the cattle were quite good. Even the sheep were a commendable collection, that is for such a district, though of course nothing to compare with the great wool-growing sections. But they indicate the ultimate development of the sheep industry in these parts, which will be more for mutton than for wool. It should certainly be a better paying proposition for the breeder to turn out a sound mutton carcass for the butcher than to trouble about the wool. The latter in the prevailing conditions should be a secondary consideration.

Some highly interesting data of the progress of the district during the past seven years was supplied by the Administrator in the course of a speech at the show. He has had access to the census returns now being completed, and stated that the figures there show that the viticultural products of the Paarl District have not only practically doubled in quantity during that period, but the price of wine and brandy has also doubled. In raisins, too, the figures quoted are almost astonishing. In 1904 the output of stalk raisins was 450 lb. weight. In 1911 it increased to 10,215 lb. The output of loose raisins in the same period had increased from 12,252 lb. to 127,789 lb. This should encourage the viticulturists to still greater efforts, for this means most profitable agriculture.

THE STELLENBOSCH SHOW.

The District of Stellenbosch put on its annual agricultural fixture in the first week of February, just a week after the Paarl show. This was also most encouraging, for, as the Prime Minister pointed out in his speech at the opening, agriculture is evidently making great progress in these parts. Here, again, we have a set of conditions which favour cereals, fruit, and viticulture. And here again is to be seen the rapidly growing interest in stock. But, in addition to these phases of industry, another has grown up of late years which promises to be of supreme importance, and that is the production of Turkish tobacco. It is to be regretted that the exhibits in this section did not more fully represent the full extent of that industry, for it is gradually assuming quite respectable proportions. But what was there was good in quality, though the judge, with one honourable exception, was compelled to comment adversely on the packing. On the other hand, some bales shown "for exhibition only" were got up thoroughly well, and should serve as an example to the others.

In the horse section there was excellent competition and the quality was good. As this section included breeding classes, both light and heavy, as well as draught and saddle horses of varying types, it will be seen that there was plenty to attract the eye. The young stock evoked special commendation.



STELLENBOSCH.—Mr J. Rawbone's First Prize Thoroughbred Stallion "Barbuda"

STELLENBOSCH.—Mr. Duvall's "Melody". Winner of Filly Class for saddle purposes.

STELLENBOSCH.—Mr. Bredell's "Bismarck". First in class for Draught Stallions. South African bred.

STELLENBOSCH.—Starke Bros.' First Prize Imported Friesland Cow.

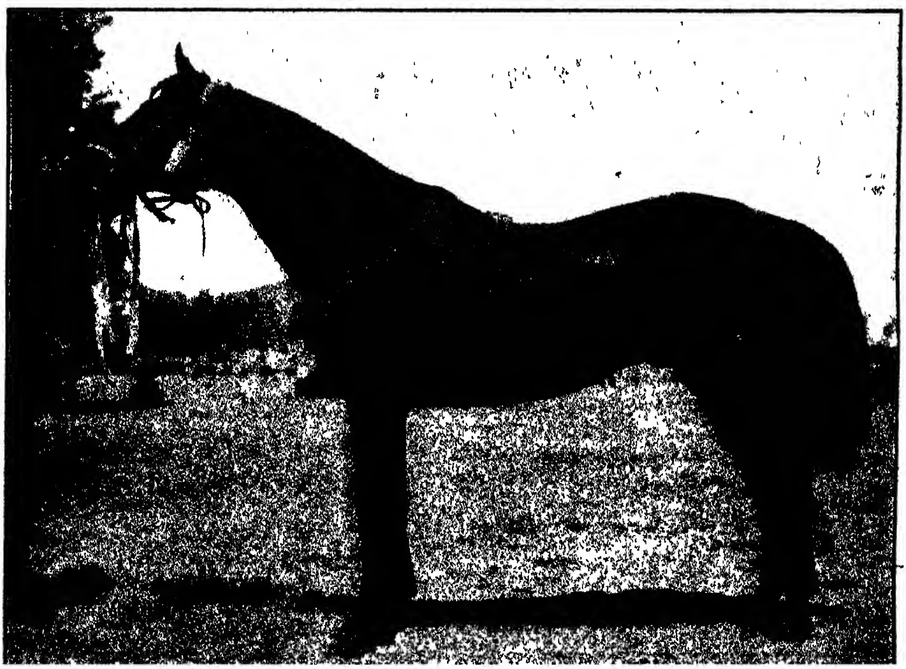
Among the cattle the Frieslanders and Dutch types led the way. There were, however, some good specimens of Ayrshires and Jerseys which were considered to be a distinct advance on last year's exhibits. Sir Thomas Smartt showed some first-class stud merino sheep, but this is not considered a woolled sheep country. The Persian sheep and cross-breds for slaughter also made a fair show. The pigs were an encouraging lot, especially the Berkshires, in which class the competition was good. The pig is evidently catching on in these parts, and as some really good animals were competing—that is good from the commercial point of view—more should be heard of this industry before long. The agricultural produce did not evoke the highest praise from the judge, who was compelled to regret the paucity of entries though the quality was right. The fruit was the best seen at this show for a long time past, and fully justified the unstinted praise of the judge.

Taken altogether, therefore, the opening shows of the season augur well for the prosperity of the Cape western districts, and with the advancing enterprise exhibited in these districts wherever one turns the future seems bright with hope.

THE ROBERTSON SHOW,

held on the 13th and 14th of February, besides being the first two-day show of the year, may be described as of an entirely different character to those previously noted. Paarl and Stellenbosch represent districts entirely typical of purely Western Province industries. Robertson and Worcester, on the other hand, impinge on the Karoo, and may be taken as representative of the more favourable Western Karoo conditions, coupled with the influences which creep in from the south-western coastal belt. As a result, at Robertson particularly, there is usually an overwhelming exhibit of stock, particularly horses, and this year proved no exception. The ostrich has made great strides in these districts, which at one time was so largely viticultural, but feathers were not a great feature. Cattle were also fairly strong, particularly Afrikanders, though the district has given a better display in the past. Even woolled sheep were fairly represented, and there can be little doubt that the future will see more of these profitable animals introduced to this district. The problem in a district like Robertson, with its enormous acreage of irrigated lucerne lands, is what to do with the tremendous output of feeding stuffs which these lands represent. So far the ostrich has largely sufficed, and the general stock, including horses. But with the continuous expansion of industry all in the same direction, with the constant increase in the lands brought under irrigation and the heavy sums expended in that form of development, the day cannot be far distant when so much wealth must develop newer methods of dealing with the resultant crop. In the past the vine was the great stand-by, and the vine will play a very important part in the future, for in no portion of South Africa can better raisins be produced than on the karroid soils of these districts. But on every hand the rapidly increasing crop is lucerne, and for lucerne to be profitable it must carry stock. As remarked above, the ostrich has invaded the land hereabouts and has sufficed so far. But the future of irrigation farming in South Africa cannot be allowed to depend entirely on the ostrich. Irrigators must look for something else to consume their crops, and when they reach this

STELLENBOSCH. Mr. O. C. M. Barry's First Prize South African Ayrshire Bull. Also First in his class at Rosebank and Champion.



ROBERTSON.—Mr. Marais' First Prize Thoroughbred Stallion "Killaloe".

ROBERTSON.—Mr. W D. Malherbe's Colonial-bred Mare "Moss Rose". First Prize.

ROBERTSON.—Mr. D. J. de Wet's First Prize Thoroughbred.

stage cattle, and sheep and pigs, will be found to be just as profitable as the ostrich, only provided that reasonable methods of management are adopted. In this connection it is safe to predict that Robertson will not be behind the times when the new developments arrive. In fact some of the leaders of industry there are even now discussing the advisability of gradually introducing other farm stock on a larger scale.

To revert to the show itself, it may be fairly described at once as: horses first; the rest, comparatively speaking, nowhere. When it is stated that while the total entries numbered just over 2000, and there were upwards of 500 horses among them, some idea may be formed of the overwhelming proportion of these animals. It seemed to be horses everywhere, until one began to wonder if it were not in reality a horse show pure and simple. The great and interesting feature was, however, the really sound and useful types of animals competing. Thoroughbreds, hackneys, and Flemings seemed the predominating types, and of these there were some excellent examples. The one criticism that might be levelled at some of the classes was the soft condition in which the animals were shown. It is probably difficult to bring forward stock in really hard condition from the lush pasturage that abounds, but it should be possible to do better than was done for a large number of the animals at Robertson this year, particularly in the breeding classes. Among the more outstanding sires of the district the thoroughbred "Killaloe", owned by Mr. J. P. Marais, and the well-known hackney "Lord Donnington", owned by Mr. W. D. Malherbe, each leader in his own section, may be specially mentioned.

Among the cattle were some good specimens of the more popular dairying breeds, such as Frieslands, Ayrshires, Jerseys, etc. But the Afrikanders, next to the cross-bred sections, seemed the strongest. Some of the ox-teams of the latter variety were quite good, though a trifle light.

Sheep were represented by merinos, Persians, Afrikanders, and cross-breds, but this was not a strong section.

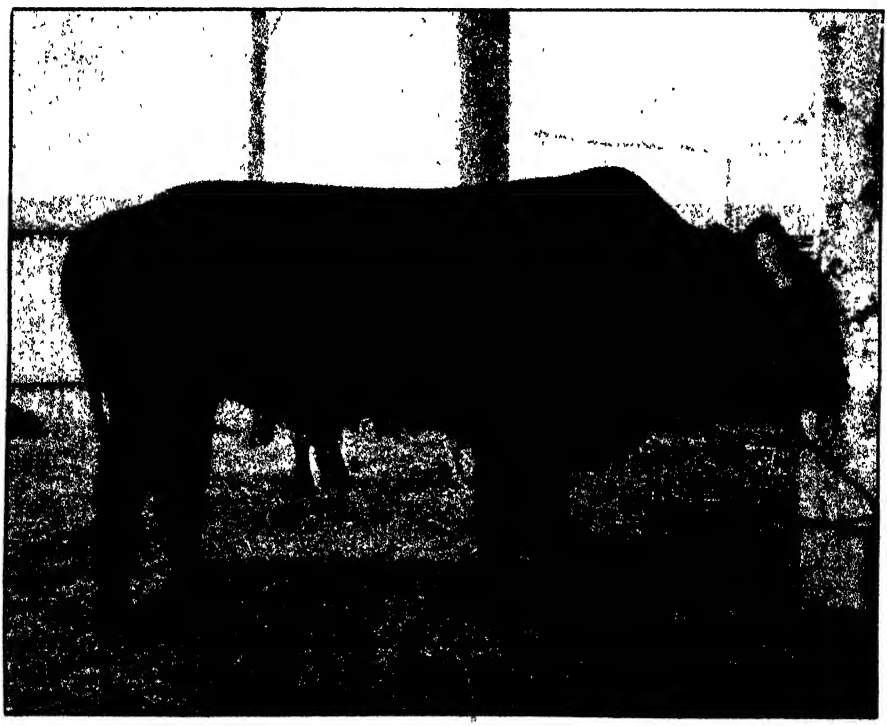
In slaughter stock, both large and small, the show was fairly good, though better should be expected of a district so rich in fertility. In the cattle there seemed too much frame and too little beef. The sheep were better covered, but they could scarcely be described as profitable feeders.

In the pig pens a few really good boars were exhibited, the best of these being the Berkshires. With so much lucerne about these animals should prove a paying investment—provided a bacon factory were started in connection with a creamery. But these things have yet to arrive.

The poultry section was a good one, as also was fruit and general produce. The quantities of fruit shown were nothing compared to Stellenbosch or Paarl, as would readily be conceived, but the quality would take a great deal of beating. In the dried fruits one special feature was some really excellent exhibits of sultanas. They were in first-class condition, beautifully got up, and a credit to the country. This kind of thing is most encouraging, as indicating the sound lines upon which these districts are developing.

The show lasted two days, and it was only well into the second day that the whole of the horse classes were completely judged,

ROBERTSON.—" Lent Lilly ", Mr. D. J. de Wet's Imported Mare.



ROBERTSON.—Prize-winning Afrikander Bull.

The Agricultural Show Season, 1912.

MALMESBURY AGRICULTURAL SHOW.

Oat-hay loaded for Market.

Among the Carriages.

Prize Team of Mules.

MALMESBURY AND PIQUETBERG.

At the Malmesbury and Piquetberg show, held at Malmesbury on the 22nd, all the conditions were favourable for a really excellent fixture, but it is to be feared that the farmers of these districts do not sufficiently appreciate the advantages such an occasion offers. Although the districts interested include the most important grain-producing sections of the Union, the visitor to this show would not think so had he relied entirely on personal observation. As a matter of fact produce generally was not over well represented, and the grain classes elicited comparatively poor competition. The largest exhibit was in the class for a load of oat-hay, in which three characteristic wagon loads, piled in the fashion of the West, were shown. A small quantity of lucerne and compressed fodder also competed, though, of the two, the latter is by far the most typical of the local industries. Among the wheats competing were some good samples of Rietti, Baard, Gluyas Early, Du Toit's, Van Niekerk's, and other varieties. Barley, oats, and mealies were also on view. The vegetables and fruit—particularly melons—were quite good, and equal in quality to anything yet seen.

In the stock lines there was a goodly array of carriage, cart, and riding horses, as would be expected, but the breeding sections—with the exception of some of the young stock—were a little disappointing. The really strong feature for quality seemed to be the jacks and mules. Of the former there was quite a respectable array of well-set-up, clean-bred Catalonians, which attracted attention, while the winning span of mules in harness would be quite a credit to any show. They were well-matched and had an alert, well-groomed appearance which speaks volumes.

The cattle were weak, comparatively speaking, in both numbers and quality, with the exception of the Dutch classes. This particular breed stood out in strong and striking contrast to the others—in fact completely overwhelmed them. As there were some excellent samples of this type competing the judges' task was not very light. The bulls were a fine lot and showed a distinct advance on the exhibits of previous years.

There was quite a respectable exhibit of woolled sheep in the merino classes, the only drawback being that some were scarcely in show condition, having been dipped quite recently. More sheep are being gradually introduced to these districts, though the conditions are scarcely ideal for wool production. However, they seem to do fairly well, and this in itself is encouraging. The sheep for districts like this, one would think, would be the mutton producer, with so big a market as Capetown so close at hand. It should be possible, with so much feed being grown, to turn some of it into mutton at a profit. Attention to this side of the local problems might help in neutralizing the tendency to lower prices for grain which has been marked recently. The Afrikander sheep and goats were a good lot, especially the former, but stock such as these do not hold out great promise of profitable exploitation.

Pigs were also a pleasing feature, the Berkshire boars being fairly good. The one fault, again, was the paucity of exhibits.

In poultry, pigeons, etc., there was plenty to look at, and the public were satisfied.

The Agricultural Show Season, 1912.

Malmesbury Agricultural Show.

A portion of the Implement Section.

The Horse Lines, with Catalonian Jacks in the foreground.

View of the Cattle Lines

Implement displays filled a large portion of the central section of the grounds, but there was nothing of special note except the all-round excellence and complete modernity of everything competing. The general use of really up-to-date farm machinery and implements is the best indication of the progress of the districts concerned in this show. This practice has grown from a necessity to a habit—and a very good and profitable habit it has proved. It is difficult to imagine the handling of a grain harvest of 270,000 muids—say roughly a million bushels—by any other means. These are the figures for 1911, just about double what they were seven years ago; and, in addition to this, has to be taken into account the enormous acreage of oats reaped as hay—or forage. The Administrator (Sir Fred. de Waal) emphasized these figures during his opening speech and at the luncheon, and urged co-operative methods on the farmers to bring the milling industry into line with the productive capacities of the districts.

BEAUFORT WEST.

The annual fixture at Beaufort West was also held on the 22nd (the same day as that at Malmesbury). For all that they did not clash, as it is a far cry both as to distance and agriculture from the one to the other. Beaufort West is essentially and entirely Karoo, and the main feature of its agriculture is stock, with merino sheep in the forefront. As a consequence sheep and wool loomed large on the local horizon on show day. Horses and cattle were a good exhibit also, while angora goats and mohair were quite acceptable.

The wool section was described by the judge (Mr. James Lamb, of Port Elizabeth, a veteran at the business) that the Karoo exhibits were the best he has seen in South Africa, and it was most difficult to decide between the competing examples. His regret was that he could not award prizes to many more of the exhibits, as so many really deserved them. In mohair, too, the same judge spoke very highly of the first prize lot. The prize-winners in these sections included such well-known names as J. R. Jackson, G. C. Jackson, M. G. de Jager, P. J. M. de Villiers, and others.

Ostrich feathers were also spoken well of, and this is not surprising considering the high quality of many of the birds in the district. The principal prize-winner here was Mr. W. W. Molteno. The prize for the best collection fell to Mr. J. L. du Preez.

The sheep section was exceptionally well filled, as was only to be expected. This has been a conspicuous feature of this show since its inception some three years ago, and it promises to be even stronger in the future. The merinos, both fine woolled and robust, made a grand show in themselves, and so even was the quality and of so high an average that the competition was exceedingly keen. Mr. F. C. Bayly again came to the fore by annexing the championship for fine woolled rams in competition with representatives of the flocks of H. Sieberhagen, P. A. Nel, J. C. T. Musto, and others, besides being awarded a championship for his robust woolled ewe (four-tooth) and a number of other prizes. The Smartt Syndicate took the championship for robust woolled rams (two-tooth), the other prize-winners in this section being B. J. du Plessis, H. Sieberhagen, and J. C. T. Musto. In ram lambs J. C. Quinton scored first and H. Sieberhagen second. In ewe lambs Paul Nel scored first and Sieberhagen second. The

prize for imported rams (any age) fell to J. C. Quinton, J. F. Celliers being second. Imported ewes: Smartt Syndicate first, J. F. Celliers second. In the unhoused section three rams (any age) reared on Karoo veld, J. C. Quinton came first, with J. W. Jackson second. For three ewes, same conditions, J. C. Quinton again came first, with G. C. Jackson second. The Cape sheep and Persians were also an attractive lot, and showed well.

The angora goat section was also good, having attracted the attention of breeders like Mr. F. C. Bayly, of Deelfontein, who took the championship with a ram selected from a pen of three. W. J. van der Merwe & Son were awarded a championship for their two-tooth ewe. The other prize-winners were F. D. Pienaar and J. O. T. Musto.

In both the horse and cattle sections the entries were more numerous than at any previous show, and the quality was distinctly good. The one drawback was the lumping together of different breeds of horses. It is not only difficult, but next to impossible, for animals of different types to compete in the same class, yet in this section, as at some other shows, this questionable method of competition is in some cases followed. The value of the horse section was thus considerably discounted, and in the future some effort should be made to get some more reasonable semblance of classification in the prize-list. Even with stallions, the breeds should be kept apart, otherwise we may have the puzzling conundrum set to our judges some day of deciding which is the better horse, a thoroughbred or a heavy draught animal. Carriage and riding horses were quite up to expectations, and evoked considerable comment.

The donkeys and mules were also a good and encouraging exhibit, and one that should be of great value to the district.

The champion prize for bulls was awarded to J. Grimbeek for an imported animal.

The slaughter stock was in good condition, and shown satisfactorily, while in cereals a fairly good exhibit was put on. Fruit and produce were fairly satisfactory, as also were the local manufactures, while there was quite an interesting exhibit of implements, including two makes of machine-shearing outfits, which in one case demonstrated their use by native shearers.

All this was very satisfactory, and the show was, undoubtedly, the best that Beaufort West has succeeded in putting on since the society started. As the surrounding districts form some of the best stock sections in the Province, this success should be repeated and improved upon. Considering that this society has only been in existence for three years, good work has been accomplished.

THE ROSEBANK SHOW.

Rosebank saw the close of the Western Province series of agricultural shows when the Western Province Agricultural Society held its four-day function during the closing days of February. Rosebank is always an exceedingly popular show and this year was no exception to the rule. The number of visitors was probably greater than upon any previous occasion for it has come to be established as a general holiday function not only for the people of Capetown and the suburbs but for the residents of a large section of the adjoining districts, independent of those who attend with the single view of agricultural or stock improvement before them. It thus serves the

very excellent dual purpose of providing both entertainment and instruction for the varying types of people who attend year by year.

The entertainments this year were largely on the same lines as those of previous years, but the educational sections were in many ways a very great advance. The most striking improvement was seen in the machinery and implement sections. It is not so very long since that the classes under this heading were rather poorly supported, but this is no longer the case. As a matter of fact the display of agricultural machinery, farm implements, and up-to-date power plants suited to nearly every form of agricultural enterprise was quite remarkable. The activities here covered included many interesting features, the most striking being the installations of sheep-shearing machinery and the suction gas plants.

Although a little late for the better class of soft fruits, the display in the fruit section generally was, undoubtedly, the finest part of the whole show. The rapidly growing horticultural development of the Western Province was here displayed to advantage. The building in which the exhibits were shown is so admirably suited to the purpose that it is almost impossible to conceive of anything really better in this particular line. The number and variety of the exhibits could find no equal in the Union.

The stock sections were, speaking generally, quite up to the usual standard with a slight improvement in quality in some of the classes, while the general exhibits were again a striking feature. This side of the Rosebank Show has grown very considerably, largely, it is to be presumed, because of the mixed character of its patrons. Where so large a section of the general public has to be catered for as is the case here, the purely agricultural side has sometimes to be supplemented by other features which the bulk of those visiting the grounds find more to their peculiar tastes. But through it all the general interest displayed in the farming features more than outweighs the other sections.

Owing to the show being held at the end of the month and the exigencies of publication, further reference has to be held over until the next issue when the illustrations will be ready.

(We are indebted to the Cape Times Process Department for the photos of the stock shown at Paarl and Stellenbosch.)

"Blue Lice" on Cabbage (Cabbage Aphis).

In reply to a correspondent at Richmond, Cape Province, who asks for a remedy for "blue lice" on cabbage (cabbage aphis), the Chief of the Division of Entomology (Mr. C. P. Lounsbury) furnishes the following notes compiled from notes published in the *Cape Agricultural Journal* in 1899. As the question is one which is very frequently asked, Mr. Lounsbury deals fully with the matter:—

No specimens were received with the letter, but it is presumed that by "blue lice" is meant the common cabbage aphis (*Aphis brassicae*, Linn.). This plant louse is pestiferous to cabbage, cauliflower, turnip, rape, and other cruciferous plants. It is an imported pest, now to be found in nearly all countries, and one familiar to our farmers from one end of the Union to the other. Complaints of its injuries are frequent.

Like other species of aphis, the cabbage aphis multiplies rapidly and without the intervention of males for a number of generations. The mother insects which produce thus are termed "agamic females". They are generally wingless, but winged individuals are oft-times produced in abundance and make use of their extra function in seeking pastures new. The offspring of these females are produced alive, and within a very few days have themselves become similar multipliers of their kind. I do not think that any one has particularly investigated the multiplying capacity of the cabbage aphis, but this species is probably not outdone by the aphides which have been studied. The wonderful rate of reproduction in the case of the green fly of roses (*Siphonophora rosae*, Reaumur) is the basis of many curious calculations that have become hackneyed stories in entomological writings. Simple allusion to the fact that an agamic female of this species assumes the cares of maternity when about five days old and thereafter turns out what we humans would consider a large family every warm day after that as long as fate permits her to live—perhaps three weeks or longer—is, I think, quite enough to impress us with the insect's fecundity. The American blight or woolly aphis of apple trees is another common species whose development has been carefully observed; W. B. Alwood, a Virginian entomologist, notes that he has reared this pest in confinement, and that from an individual isolated on 30th May the lineal descendant in the *twelfth* generation appeared on 20th September, less than four months later! There is every reason to think that the cabbage aphis is fully as prolific.

There is, of course, a natural reason for such remarkable prolificacy. Aphides are insects that are extremely susceptible to meteorological changes, and, while given favourable conditions they appear as if by magic, given unfavourable conditions they disappear with even greater abruptness. Then again they are the natural prey for a host of predaceous enemies. Parasitic wasps, lady birds,

syrphus flies, and aphis-lions make fearful inroads on their resistless masses, and where a horde of aphides is seen one day, nothing more of them than a few clinging skins, sucked dry by relentless foes, may be found on the next.

The conditions surrounding the life of an aphis are, then, such as may call into being a crop pest of much importance in a short space of time, and in the consideration of remedies and preventives this fact should be kept in mind. The factors that favour the increase of the cabbage aphis, aside from meteorological conditions are principally local or seasonal scarcity of natural enemies, poverty in the plant produced by lack of sufficient plant food or water in the soil and the food supply and shelter afforded the insect by the plant. But no amount of favouring conditions will produce an aphis. A single aphis may in the course of a month become the progenitor of myriads of descendants, but without the one to start with there can be no others. Moreover, every additional one at the start directly multiplies the number at the end of the month.

Now as far as individuals are concerned, few kinds of insects are more easily disposed of with insecticides than aphides. Owing to its body coating of bluish, flour-like substance, the cabbage aphis is more difficult to treat than most species, but even it is not hard to destroy. Paraffin emulsion is the killing agent generally recommended, but resin wash, tobacco water, water containing a pound of soap to four to six gallons, and probably any of the carbolic sheep dips are efficacious to a large degree. Tobacco water is particularly valuable against aphides, but its deficient "wetting capacity" is an important disadvantage in the case of bloom-covered cruciferous plants. Non-arsenical tobacco sheep dips may be diluted to contain about 1-10th per cent. of nicotine, which is usually equivalent to 1 part in about 75 of water, for the purpose. But the economy of spraying a field of rape or any other cruciferous crop badly infested with aphis is questionable under the farm conditions ordinarily prevailing in South Africa. For, unless it will pay to have the application made very thoroughly and repeated several times, the work may be time and money thrown away. Nine-tenths of the insects might be destroyed, and the number of living a week later be just as great as it was before the spraying. The character of the plants adds to the difficulties, the peculiar water-repellant surface of the foliage of some and the deeply wrinkled or closely whorled foliage of most proving serious obstacles to effective spraying. Altogether, the practicability of insecticidal measures, outside of the home garden, is largely confined to an early stage of the infestation. If operations are begun when only a small proportion of the plants are infested, a relatively trivial amount of work will stay the pest. If begun very early in the attack, the hand-gathering and subsequent destruction of a few infested leaves or tips may obviate the necessity of all further measures. Greater value, however, lies in measures that are preventive rather than remedial. The progenitors of the aphides found on the new plants early in the season must have come from somewhere. This "somewhere" may be the remnants of a former crop, or of cruciferous weeds on the same piece of ground, or an infested and perhaps worthless patch of another cruciferous vegetable growing close by. How often does one see a plot of promising young turnips in home gardens growing in the proximity

of lousy cabbage stumps that sooner or later must be pulled up because utterly worthless! The destruction, not simply the pulling up, of such old and valueless rubbish before the young plants are started would greatly minimize the subsequent aphis infestation and perhaps render additional measures quite unnecessary. A great deal towards reducing the injury to a crop by the cabbage aphis may also be done through paying heed to the factors cited as particularly favouring the increase of aphides. Cruciferous crops are rank feeders, and a shortage in their supply of plant food goes a long way in increasing the apparent damage from the aphis. Scarcity of water has a similar effect. In general, as the nourishment obtained by the infesting insect diminishes, the greater becomes the proportion of winged agamic females. These winged aphides leave the sickly plant and fly away to become the foundresses of new colonies. It follows that furnishing ample plant food and water for the crop indirectly retards the spread of the pest.

The agriculturist has less control over the other factors favouring the multiplication of the insect that were mentioned. Cruciferous plants, as a rule, afford a considerable degree of shelter for aphides so that some survive even very unfavourable spells of weather; and, beyond the removal and destruction of hopelessly infested plants and perhaps of the worst foliage on other plants to more fully expose the insects remaining to the elements, the farmer can do nothing. Neither can he do much towards quickening the destruction of the insects by their natural enemies. The insect destroyers of the cabbage aphis appear to be principally internal parasites which, as adults, are tiny wasps. Sometimes nearly every cabbage aphis that one examines shows evidence of the past or present operations of these minute friends of the gardener. The farmer, however, cannot easily interfere to encourage their good services, and by the time the parasites alone have conquered the pest, the pest may have nearly conquered the plant. Naturally the parasites die off when the aphides perish from any cause, and the aphides are able to multiply faster than they do under some conditions of weather. Several fungoid diseases are recorded to affect the cabbage aphis, and the principal one of these (*Empusa aphidis*) is sometimes observed in the most humid parts of this country. The diseased aphides swell and become coated with a fine pubescence, and when they die they generally remain attached to the plant for some time.

In very small gardens the cabbage aphis can be held down by the liberal use of pyrethrum insect powder, and if water under heavy pressure is laid on, or if a strong spraying pump is available, the simplest and best treatment may be that of dislodging the insects with a strong stream of water from a hose.

Notes.

Anthrax and the Wool and Mohair Trade.

In the last issue of the *Journal* a statement was published in connection with the anthrax situation, urging upon stock owners the necessity for the adoption of greater precautions in dealing with this disease than many of them unfortunately have taken. Whilst the disease might certainly soon become a serious menace to the stock industries of the country were it not under the strict and firm control which the department is now exercising, at the same time there is no doubt that a great deal of unnecessary alarm has been caused by statements which have appeared in the daily press. Although, improperly controlled, the disease might spread with dangerous rapidity, yet it is simple to handle provided the proper precautions are taken, as the recommendations published in last month's *Journal* show. Stock owners are earnestly recommended to study those suggestions carefully, and, by acting upon them as soon as any suspicious outbreak of disease appears, so co-operate with the veterinary authorities in their endeavour to stamp out the disease. Out of the anthrax situation arises a question very closely affecting the interests of wool growers; that is, the effect which the presence of the disease may have upon the export trade in wool and mohair. It may be mentioned that the Anthrax Investigation Board of Bradford has found it possible to cultivate anthrax bacilli from blood-stained mohair imported from South Africa. This is a serious matter, as contaminated mohair is a source of great danger to those handling it, and the Board therefore strongly urges upon producers of wool and mohair in South Africa to pack any blood-stained material separately and mark the bales accordingly. If this be not done, it is quite within the bounds of possibility that the Home Government may feel obliged to take steps, in order to protect Home interests, which will have anything but a beneficial effect upon the South African wool and mohair trade.

Ringed Storks—Assistance from Farmers.

The Director of the Port Elizabeth Museum (Mr. F. W. FitzSimons) writes:—Professor J. Thienemann, on behalf of a scientific institution in Rossitten, Prussia, has for some time past caused white metal rings to be placed on the legs of nestling storks in various parts of Europe. The object is to ascertain the migratory habits of these birds. The rings are inscribed with a number. If any such should come into the possession of a reader, he would be aiding scientific research if he would be so kind as to forward it, with details of how he got it, to Mr. I. L. Drege, chemist, Port Elizabeth, who has undertaken to collect and forward these rings to Professor Thienemann. The stork referred to is the kind commonly known as the Great Locust Bird, Springhaan Vogel, or Ingolantete (*Ciconia alba*).

Plough for small Irrigation Furrows.

Wheat growers and others who practise irrigation will be interested to learn that the Cradock Agricultural Society (Cape) has decided to offer at its 1913 show a £25 prize for a plough suitable for making small furrows such as are necessary in wheat lands for irrigation purposes. The usual method of making such furrows is to plough the ground loose and have it thrown out by natives with spades, and it is to do away with this hand work in making and cleaning small furrows that this special implement is required. Experiments made locally have demonstrated that a great deal of time and manual labour can be saved by such an implement.

Production of Butter during 1911.

During the year 1911 the several creameries of the Orange Free State turned out 3,056,244 lb. of butter, valued at £189,858. 12s. 11d. The total cream produced at 40 per cent. average, amounted to 2,827,463 lb., valued at £141,373. 3s.; 468,170 gallons of milk were sold for local consumption, valued at £15,605. 13s. 4d.; 248,032 gallons of fresh milk, worth £8184. 9s. 8d., were sent out of the Free State; whilst the value of milk for cheese production and of cheese manufactured amounted to £454. 6s. 8d. and £85. 17s. 6d. respectively. Of skin-milk at 90 per cent. 6,876,549 gallons were produced, valued at £3581. 10s. 8d.; whey at 85 per cent., 11,585 gallons, worth £6. 0s. 8d.; and butter-milk, 4,584,366 gallons, valued at £2387. 13s. 9d. The quantity of cream at 40 per cent. average sent out of the Orange Free State was 76,843 lb. These figures do not include goats' milk, milk used on farms for domestic purposes, or feeding of calves; and the figures relating to butter production do not include home-made or farm butters made for sale or domestic purposes.

Sale of Fruit Boxes at Railway Stations.

Fruit growers and others should note that it has been decided that the sale of fruit boxes by the Railway Department to farmers in the Transvaal shall be discontinued, it being considered that the time has arrived when supplies of this nature can well be entrusted to private enterprise or to co-operative societies and other agencies.

A Prolific Cow.

Mr. Eric Crossley, Sun Rising, Banbury, writing to *The Field*, states that one of his Jersey cows was served on 15th January, 1910, and came in season again on 7th April, 1910, and again on 8th June, 1910, and on each occasion she was served by the same Jersey bull. On 21st December she dropped a full-grown bull calf a month overdue to the first service. Now, this cow had regularly given between twelve and fourteen quarts a day, but after calving on 21st December she gave only six or seven quarts a day, and lately we have seriously thought of getting rid of her, as she is ten years old, and seemed to be going off in her milk. Recently we were looking at her closely, and she seemed to be getting very big again, and her udder was increasing in size. Imagine our surprise when, on Easter Sunday, 16th April, she dropped another full-grown bull calf, all but four months after the December calf. The first calf was evidently born to the service of 15th January, 1910, and the second to the service of 8th June, 1910.

Rooibloem Investigations.

Investigations in connection with Rooibloem or Witchweed (*Striga lutea*) are being continued by Professor Pearson, of the South African College, Capetown, a preliminary note on which appeared in the September, 1911, issue of the *Journal*. Farmers and others interested in the matter, or who desire information, are invited to communicate direct with Professor Pearson who will at all times be pleased to hear from such persons.

Fine Shearing Records.

Some splendid shearing records were put up at Cambridge Downs, Queensland, this season. The work lasted at the shed for four weeks and two days when 117,000 sheep were put through by a board of thirty-eight shearers. One of the number, named Harrison, rung the shed, and on one day, in ewes and lambs, the team cut the remarkable average of 198½ sheep per man. Harrison was top with 265. It is claimed that this is a world's record. The best man in Australia is believed to be Harry Livingstone, who recently shore, in successive days, 233, 225, 237, and 221 sheep. Men for miles around will travel to the shed to see Livingstone shear. All the gangs work with wide-bladed shears now. As far as numbers are concerned the sheep handled by the swifts do not come up to the records put up by hand shears fifteen to twenty years ago, but the sheep now carry much more wool than formerly. The record put up by Jack Howe of 321 sheep in eight hours, many years ago, will probably never be beaten now, as the hand-shears are out of use and the fleeces are so much heavier to handle.

Sale of Tobacco, Western Province.

At the request of the Government the Capetown Chamber of Commerce will hold the second annual public sale of the remainder of the crop of tobacco grown in the Western Province during the past season, at 10.15 a.m., on Monday, 20th May, 1912, at Mr. Marcus' Auction Mart, 30 Burg Street, Capetown. A large proportion of the crop has already been disposed of by private treaty, and the balance now offered for sale consists of approximately 43,050 lb. Turkish and 2400 lb. Virginian from Paarl, French Hoek, Houw Hoek, Tulbagh, Stellenbosch, Helderberg, and Muldersvlei. The Chamber of Commerce draws attention to the following points, which sellers and buyers should carefully note and adhere to:—(*a*) The sale will be by auction; (*b*) a suitable auctioneer will be appointed, and his charges will be borne by sellers in proportion to the quantities offered and the prices realized by each respectively; (*c*) all tobacco for sale must be sent, and no sale will take place through samples; (*d*) all accounts against buyers will be paid to the treasurer of the Capetown Chamber of Commerce, and sellers will be paid by the treasurer after deducting the auctioneer's fee of 2½ per cent.; (*e*) all tobacco for sale must be addressed to Mr. John Marcus, 30 Burg Street, Capetown; (*f*) the carriage of all consignments must be paid by the senders, and no tobacco will be received for sale upon which carriage has not been paid; (*g*) the tobacco must be delivered to Mr. John Marcus at 30 Burg Street not later than the morning of the 13th May. Buyers and sellers will accept weights as certified by the Chamber of Commerce; (*i*) the bales of each seller will be numbered consecutively, and each seller's

complete lot of bales of each particular kind of tobacco will be put up for auction as one lot. The highest bidder to be the purchaser, and to have the privilege of selecting any or all of the bales in any one lot, but not less than one bale. The bales not selected by the highest bidder in any one lot will then be again put up, and the same procedure followed until any one complete lot has been sold; (*j*) buyers must take delivery of the tobacco purchased within forty-eight hours from the conclusion of the sale. After that period has expired a charge of one penny per bale per day will be made for storage. Such tobacco will be held only at risk of the buyer, and no liability will be recognized, either by the Chamber of Commerce or Mr. Marcus, for depreciation in the value of the tobacco from whatever cause arising; (*k*) all tobacco unsold must be removed by the owners within one week of the sale, otherwise storage at the rate of one penny per bale per day will be made beyond that period. Such tobacco will be held entirely at the risk of the owners; (*l*) all sales are for cash. Accounts must be paid promptly to the treasurer of the Capetown Chamber of Commerce, whether the tobacco is removed or not. Interest at bank rate will be added to the accounts after three days have expired from the date of rendering the account. It is hoped to continue the sale annually; and producers should bear this in mind throughout the year and make their arrangements accordingly.

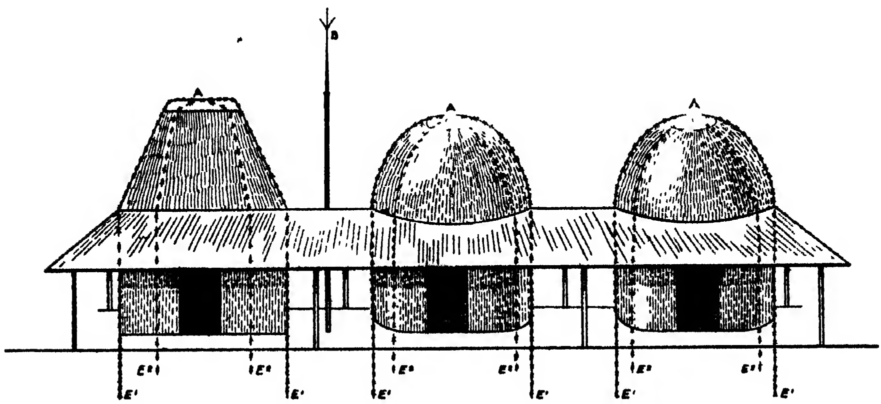
Essays on Bee-Keeping.

Bee-keepers will be interested to learn that Major F. Douglas McMillan, of Kingwilliamstown, has offered prizes amounting to £6. 6s. for two essays in apiculture, open to all bee-keepers in South Africa. The subjects of the essays are (1) the best brood chamber for the South African queen bee, and (2) the best type of hive for South Africa. Full details as regards conditions will be found in the current issue of the *South African Bee-keepers' Journal*, published in Johannesburg.

Protection against Lightning.

From Mr. Geo. Somers, P.O. Box 18, Mbabane, Swaziland, comes another interesting query arising out of Mr. Innes' recent article on "Efficient Protection against Lightning". Mr. Somers' difficulty may be given in his own words, as follows:—"I have a camp here consisting of three wattle and daub huts. They have all thatched roofs with the usual tin cap. The huts have a frontage of some 50 feet. The huts are separated by gangways of some 5 feet broad. The fronts of the huts, as also these gangways, have a veranda of galvanized iron. In the grounds surrounding the huts are several large trees—blue-gum, wattle, black-wood, and the like. The nearest trees are some 30 feet distant. Being extremely nervous of lightning, and since Mbabane is rather frequently visited by extremely bad thunderstorms, I bought a lightning conductor. This conductor I erected on an 18-foot pole some 12 feet distant from the bedroom. The rod is a 5-foot one, having three spikes at the top. The earth connection is in a 3-foot square copper plate sunk 4 feet below the bed of a water furrow. The question now arises, how can I obtain a more efficient protection? Had I placed the conductor on the top of one of the huts (the bedroom by preference), and had I carried the cable over and touching the thatch, what would have been the result had the rod actually been struck? Could not some use be made of the iron

veranda? It was suggested that I should run lengths of the ordinary barbed wire across the tops of the huts, allowing the wire to rest on the thatch but be insulated by means of the necks of glass bottles. This wire, it is suggested, could be connected to the veranda, which, in turn, could be connected to earth. The three huts are in a row. The iron of the veranda touches the grass of the roofs at many points." The accompanying sketch, based upon one supplied by Mr. Somers, illustrates the position.



Mr. Somers' letter was referred to the Director of the Transvaal Observatory (Mr. Innes), who replies as follows:—As the roofs of the thatched huts occupied by Mr. Somers have tin cappings and an iron veranda, efficient protection from lightning should not be difficult. Barbed wire attached to the iron veranda should be carried to the top of each hut and down on the other side into the ground. As the wire can start from two places on the veranda and cross over the top of each hut, there will really be four strands of wire across the top of each hut. It should be seen that the iron veranda is properly "earthed"; this is done by continuing the wire over the veranda, down the posts, and into the ground—and of course the wire which goes down the backs of the huts should also be properly earthed. In my own mind it is doubtful whether the conductor which Mr. Somers has erected is protective or otherwise in its effect. Mr. Somers suggests that wire resting on the thatch should be insulated by means of the necks of glass bottles. This does not seem necessary. If a lightning flash does happen to strike a place it is practically impossible to prevent some sparking.

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

CASTRATION OF BULLS.

To the EDITOR of the *Agricultural Journal*.

SIR,—In the February number of the *Agricultural Journal*, Mr. Jac. Steenkamp has a letter favouring the castration of bulls at the age of from twelve to eighteen months. In former years I also castrated at about this age, but for the last ten years or so I have castrated the calves when they were three or four weeks old. When I first tried castration at the few-weeks-old age I did a limited number of calves, to be compared with the calves operated on after twelve months of age—and the calves castrated young grew into larger oxen, and were even superior for working when mated with the late castrated oxen. This experiment decided me to continue the practice of castrating the calves as soon after the naval string had dropped as possible.

When the calves are operated on young they suffer less pain, do not swell, hardly bleed at all, and receive no check in growth. And all these evils attend the later castration.

I do not consider Mr. Steenkamp's argument in favour of "stronger and harder muscles" as being a recommendation for a good, tender roast of beef.—Yours, etc.,

CHAS. R. SKOTTOWE.

Mooi River, Natal, 22nd February.

DYNAMITE FOR TRENCHING.

To the EDITOR of the *Agricultural Journal*.

SIR,—I am going to put in about 10 acres of vines this coming season, and as I have seen an article on dynamite used for loosening the soil, instead of trenching, I would like to know if you or any of your readers can give me any particulars, such as how deep to put the cartridge, what charge to use on a gravelly soil, and distance apart to put charges, so that it will thoroughly break the ground up. The article, I might say, mentions none of these.

Trusting you will be able to give me particulars.—Yours, etc.,

T. M. GARLICK.

Glenelly, Stellenbosch, C.P., 4th January.

[The above letter was referred to the Government Viticulturist (Cape), who replies: "My personal opinion is that proper trenching is to be preferred to the blasting with dynamite for the establishment of young vine plantations. The trenching should be done to the depth of 24–30 inches, according to the nature of the soil." If any readers have ever had actual experience of trenching with dynamite, perhaps they will place their experience on record for the benefit of Mr. Garlick and others.—EDITOR, *Agricultural Journal*.]

TANNING HIDES AND SKINS.

To the EDITOR of the *Agricultural Journal*.

SIR,—Will some reader be good enough to give us concise directions for tanning hides and skins by means of alum and salt. I understand that the process is a very simple one, and I am sure many farmers would be glad to know how to set about it.—Yours, etc.,

"KUIP".

Division of Hay, C.P., 3rd February.

CURE FOR JIBBING HORSE.

To the EDITOR of the *Agricultural Journal.*

SIR,—In reply to your correspondent, Mr. J. A. Dales, *re* a cure for a jibbing horse In the first place he must notice particularly that the harness fits properly and does not pinch or chafe at all.

If the horse is a real rank jibber, the best plan is to outspan and drive him (without the cart), and administer a sound thrashing. If he still refuses to pull, leave him in the cart in a safe place until he gets fed up; another good plan is to work him with a span of mules for a time.—Yours, etc.,

G. C. TURNER.

P.O. Box 147,
Germiston, 19th February.

GREASY HEELS.

To the EDITOR of the *Agricultural Journal.*

SIR,—The simplest and most effective remedy for cases of ordinary greasy heels is to mix common black gunpowder (bus-kruid) with vinegar, into a thin almost liquid paste. The heels should be washed with warm water, dried with a cloth, and the mixture rubbed on with the finger. Two applications at intervals of a day or two, will cure any ordinary case.—Yours, etc.,

"MOP."

Hay, C.P., 3rd February.

POISONING SPRING HARES.

To the EDITOR of the *Agricultural Journal.*

SIR,—In my letter appearing in your January issue, I inadvertently recommended the use of arsenic instead of strychnine for poisioning spring hares. If Mr. Blanckenberg uses the latter poison instead of the former, he will find the spring hares within a yard or so of the place where the baits are laid.—Yours, etc.,

J. I. KEELEY.

LAMZIEKTE EXPERIENCES.

To the EDITOR of the *Agricultural Journal.*

SIR,—I am an old man of over sixty-three years of age and have had much experience with the hated lamziekte. It is now over thirty-six years that I have been living in the Hay District, and I would like to tell some of my experiences with lamziekte in cattle and small stock. I have tried many remedies during the thirty years, but did not find one that cured lamziekte and, believe me, remedies alone will not cure lamziekte.

In the year 1881 it rained very much. Nobody then recollected it ever having rained like that before. East of Griquastad is the Kaap Plateau, which is covered with olive and karee trees and the vaal bush, with thousands of pans between the trees. These pans were so full that a ship could have floated on them. As a result of the rains a plant with a very smooth surface, very much like a sea bamboo, grew.

There was an awful stench when the water began to dry up. In 1882 some of the other farmers and I began digging wells, when lamziekte broke out. The animal got paralyzed and when he stood still trembled in the shoulders and hind quarters, and we called the malady lamziekte. Within a year thousands of cattle had died on the Kaap Plateau. We tried everything we could think of, but nothing helped. Even trekking with the cattle was tried, but this only served to spread the disease, so that to-day it is found in all four Provinces. Then we thought it must be a known disease. I inquired from the old inhabitants of Griqualand and Bechuanaland, who are now all dead—Lukas Kock, Prins Nero, Karel Kruger, Klaas Kruger, Notzuberer, Legutzui, Ganje, Gamaliel—and they told me that the disease was an unknown one, and that their fathers had never told them anything of it.

I read of many people who have found remedies for lamziekte, but when the remedies are tried they fail. My experience is that lamziekte can be exterminated, and I have done it, too, and will prove it. I possessed two farms on the Kaap Plateau where lamziekte was prevalent. My neighbours and I lost everything. I lost about 500 head of cattle and had nothing left. I then started cleaning my farms. I had every bone on the farms collected, and gave my herds tobacco, etc., to do so—it did not matter of what animal the bones were—and burned them. A year later when the farms were clean I again got cattle. Some got ill, but not many. The sick ones were isolated, and, if they died, were burned to ashes—yes, even the dung was burned. The place where the animal died was disinfected, especially where the mouth lay, as the saliva is very infectious. In 1895 I sold my farm and guaranteed

it clean. I sold 400 head of cattle. It was not two years afterwards when lamziekte broke out again on the farm, because my successor was not so careful. There is a certain Mr. Smith who did the same as I did, and is to-day still farming and has not had lamziekte on his farm. In the year 1899 I bought the farms Poortje, Mooipan, and Hasendal, 9500 morgen. The ground was infected with lamziekte. Again I had to clean the ground, fence it, and separate a place for sick animals. As soon as I noticed that an animal was sick he was taken to that place, and twice each day I lifted him and gave him oats. On the eighteenth or twentieth day he was quite well. The fever must have left the animal quite before I allowed him amongst the other animals. If the animal died he was skinned and buried.

Cattle and small stock must not be allowed to come near the skin. If you want to keep the skin, it must be well salted and not put in water where cattle and small stock are allowed to drink. Do not believe that lamziekte is in the veld or is caused by thorn trees. It is caused very much like giftziekte, but is very infectious. A healthy animal must not come near a diseased one. The bones, entrails, and dung are all infectious. If people will only be more careful and exact they can easily exterminate lamziekte. And if they follow my advice oxen will soon be £5 to £6. Any one can come and see and inquire whether I have lost any cattle during the last four years. Government can also make inquiries. Remedies will not exterminate lamziekte, but the keeping clean of farms. Do not let any strange cattle come near yours. Be exact—that is the remedy for lamziekte.—Yours, etc.,

P. J. C. VAN ZIJL.

Poortje (Van Zijlshoop), Griquastad, Hay.

SOAKING SEED.—WEANING CALVES.

To the EDITOR of the *Agricultural Journal*.

SIR,—I see in your correspondence columns of the *Agricultural Journal* of December, 1911, an inquiry as to whether mealies and beans are to be irrigated before their appearance above ground. This is not desirable, as far as beans are concerned. The ground forms a crust and the plant is not strong enough to penetrate same, or a leaf gets buried under the ground which is washed over it by the water, and this interferes with the growth of the plant. Old gardeners will know better.

The weaning of calves.—Mr. J. P. Gericke asks how calves are to be weaned when running with their mothers. Take a piece of board with four holes at the four corners; fasten with a string round the horns and the lower portion with a string round the mouth. It must be wide enough so as to enable the calf to eat. Spike the board so that when the calf attempts to drink these spikes will prick the cow. The board must be according to the face of the calf, broader at the top and narrower at the bottom.—Yours, etc.,

J. MARAIS.

Vergenoeg, P.O. Oliphantshoek, via Kuruman.

CHROME LEATHER.

To the EDITOR of the *Agricultural Journal*.

SIR,—Can any of your readers tell me what constitutes "Chrome" leather, and describe the method of preparing it.—Yours, etc.,

"RAW SOLE."

Hay, C.P.

EAST COAST FEVER.

To the EDITOR of the *Agricultural Journal*.

SIR,—In the July issue of your *Journal* there appears an article by Mr. R. W. Dixon, M.R.C.S., Acting Assistant Principal Veterinary Surgeon (Cape), under the heading "East Coast Fever, its Prevention and Eradication", from which the following is an extract:—

> "The average incubation period lasts about ten days and the duration of the disease about thirteen days, the average time from infection to death being about twenty-five days. It will thus be seen that the disease is slow in its progress, and not quick to kill, as many imagine."

This I take to be correct, and is corroborated by the Veterinary Department in this Province.

Now, some little while back, about two months ago, a young calf aged twelve days, died on the farm Boschkoppies in this district, and smears were taken from the beast and sent to Pretoria for microscopic examination and inspection, with the result that the beast was found to have died of East Coast fever, and the farm was consequently placed under quarantine.

Then again, during the early part of last month, a cow died in Pietersburg, which had only arrived from the Cape Peninsula (a clean area) twenty days before it died. Smears were taken from the beast, sent to Pretoria, examined, and declared to be East Coast fever, and the town placed under quarantine.

Surely there must be something wrong somewhere, and I will be very pleased if you will publish this letter in your next issue of the *Journal* with a view to getting a satisfactory reply from the proper quarter, as I am greatly interested in the matter, and many others with me are anxious to have this explained.—Yours, etc.,

J. W. JOHNSON.

Pietersburg, Transvaal, 15th February.

[The above letter was referred to the Acting Principal Veterinary Surgeon, who furnishes the following note:—The statement as to the age of the calf and the length of time which the cow had been in Pietersburg, is not quite in harmony with the information received by the Department. The calf to which reference is made, was alleged by the native owner to be fourteen days old when it died, but the stock inspector reported it looked more like a calf a month old; while the cow died twenty-two days after its arrival, i.e. it arrived on 20th December and died on 11th January. The opinion expressed in Mr. Dixon's article is quite correct, but although the *average* period of incubation is about ten days and the average duration of the disease about thirteen, the minimum period is considerably less, as cases are on record in which animals died of East Coast fever sixteen, fifteen, and even fourteen days from the day upon which the infected ticks became attached to them.]

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal.* In all cases replies will be posted to correspondents so soon as same have been procured.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

EMPANGENI AND LOWER TUGELA DISTRICTS FOR SHEEP.

J. Brereton Faram, P.O. Box 367, Durban, writes :—Will you kindly inform me if the land situated about ten miles to the north-west of Empangeni, Zululand, on high ground, is suitable for sheep ? I understand it is good cattle land. If you consider it suitable for sheep, what breed do you recommend ? Also, is the land near the Lower Tugela Station (Natal) suitable for sheep ?

Answer.—The Director, Division of Agriculture, Natal, replied :—It may be stated that little success could be anticipated in this branch of live stock husbandry in the conditions obtaining in these areas. Excessive heat, virulent heart-water infection, and the prevalence of malarial diseases, such as blue-tongue, prohibit the successful management of any but native sheep, which apparently enjoy some measure of immunity. The alleged resistance of Persian-haired sheep to heart-water invasion led to an experiment in 1908 by the Department in the introduction of this type to the coast belt. Owing to an early and heavy mortality, however, the flock had to be withdrawn. Veld-bred cattle, on the other hand, when regularly dipped or otherwise cleaned from ticks, do well in the district lying to the north-west of Empangeni, as good winter grazing is available.

INSECTS DESTROYING ROSES.

E. de Souza, Boschhoek, Lydenburg, writes :—I send you by this post specimens of insects which have become a pest during the last few years in these parts. They attack roses and peach trees in millions, and even mealies (leaves). Can you tell me how to destroy them ?

Answer.—The Chief of the Division of Entomology replied :—The insects are a kind of leaf-eating beetle, which live on a great many wild plants, and no doubt the veld vegetation form the breeding places from where they swarm over the cultivated grounds, attacking all kinds of young growth. The remedy is to spray the trees and plants which suffer from their attack with a poisonous mixture made of arsenate of lead, 1 lb. in 25 gallons of water. The poison sticks to the leaves for a long time once it has dried on them and one thorough spraying should be sufficient.

ARTIFICIAL INCUBATION OF OSTRICH EGGS.

P. Hamersma, Bloemhof, via De Aar, C.P., writes :—About six months ago I bought an "Essex-model" incubator. I placed sixty fowl and duck eggs and eleven ostrich eggs in it. I kept the temperature at 102° F. The ostrich eggs felt very warm, but the others were of the same temperature as those hatched by hens. After about two weeks I found, by breaking the eggs, that they were neither bad nor hatched, but were somewhat darker than freshly-laid eggs. I again put some fowl and ostrich eggs in and kept the temperature between 95° and 97°. The eggs now had the same temperature as those hatched by an ostrich. After twenty days the ostrich eggs were just the same as the first lot. Could one of your many readers tell me what is wrong ? (1) Is the thermometer perhaps not correct

(I used two thermometers, which showed exactly the same temperature). I think the machine is made for fowl eggs. The heat reaches the breeding space from the top. (2) Can it be perhaps that as the ostrich eggs are higher than the fowl eggs, they consequently get much warmer ?

Answer.—The Poultry Expert (Transvaal) replied :—It is not wise to attempt to hatch ostrich and fowl eggs in the same incubator, for I understand that ostrich eggs require a temperature of 98° to 100°, whereas fowl eggs require a temperature of 102° to 105° degrees according to the temperature of the room, and ducks usually hatch best at 102°, but if all the eggs are put in the same incubator, the ostrich eggs would naturally, owing to their greater size, be in a higher temperature than would the fowl and duck eggs. From your description I think that the fault lies with the male birds and not with the incubator, as from your description it would seem that the eggs were unfertile.

Johannesburg Live Stock Trade.

SOME FIGURES FOR 1911.

THE Johannesburg Municipality have issued an interesting compilation reflecting the trade in live stock, as carried on at the Municipal Market, during the year just ended. The returns show the numbers of animals of various descriptions which passed through the market during 1911 and the maximum and minimum prices realized during each month of the year. The returns are necessarily bulky, but the following summary will give some idea of the extent of the trade done and of the general range of prices over the year :—

Description.	Totals for the Year. No.	Maximum. £	s.	d.	Minimum. £	s.	d.
Horses	18,376	60	0	0	1	0	0
Mules	3,091	43	10	0	1	15	0
Asses	2,546	37	0	0	1	15	0
Bulls	12,811	30	0	0	3	10	0
Bullocks	12,297 / 64,952	21	0	0	1	10	0
Cows	10,765	45	0	0	1	0	0
Heifers (over 2 years)	81	16	0	0	2	0	0
Heifers (under 2 years)	2,558	14	15	0	2	10	0
Steers (over 2 years)	75	6	10	0	4	2	6
Steers (under 2 years)	5,138	9	10	0	1	10	0
Pigs	33,673	0	0	$4\frac{7}{8}$	0	0	$1\frac{1}{2}$
Calves	2,011	6	12	6	1	5	0
Sheep	688,379	1	13	3	0	3	3
Lambs	1,472	0	13	0	0	6	6
Goats	12,840	0	19	6	0	3	0
TOTAL	859,075						

Results of Egg-Laying Competitions.

WESTERN PROVINCE AGRICULTURAL SOCIETY.

Fourth Egg-Laying Competition.—16th May, 1911, to 15th May, 1912.

RECORD FOR JANUARY, 1912, AND TOTALS TO END OF JANUARY.

Pen Number.	Owner.	Breed. (Six Birds to a Pen.)	Record for Month. Eggs.	Record for Month. Weight. oz.	Record for Month. Weight. drms.	Total to Date. Eggs.	Total to Date. Weight. oz.	Total to Date. Weight. drms.	Position to Date.
1	F. W. Nicholson..	Buff Orpingtons..............	38	79	13	378	796	15	25th
2	F. T. Hobbs	Silver Wyandottes............	39	77	5	427	837	0	24th
3	A. Riley.........	Black Minorcas (R.C.)..........	33	66	5	310	613	5	26th
4	N. Cole	White Leghorns (Amer.)	72	140	2	535	1047	15	17th
5	S. T. Jones	White Leghorns (Amer.)	38	84	0	503	1086	6	13th
6	H. Curtis..	White Leghorns (Amer.)	63	133	5	554	1155	7	9th
7	S. C. Skaife......	White Wyandottes............	62	115	7	490	889	13	22nd
8	A. Keppie.......	White Wyandottes............	37	67	8	478	885	5	23rd
9	S. A. West.......	White Leghorns (Amer.-Danish)	34	72	10	485	1050	7	16th
		(5 birds only: 1 died 5/11/11.)							
10	H. H. Bright.....	Black Leghorns	51	98	4	671	1327	6	5th
11	B. Kauffmann ...	Brown Leghorns	49	91	1	533	1069	12	14th
12	B. Kauffmann ...	Black Leghorns	56	117	1	508	1089	10	12th
13	C. W. Pilkington .	Rhode Island Reds	66	141	0	418	911	10	21st
		(5 birds only; 1 died 29.1.12).							
14	W. P. Cowan	White Leghorns (Eng.)........	86	172	9	696	1356	13	3rd
15	A. J. Stacy......	White Leghorns (Aust.-Amer.)	69	148	7	693	1461	7	1st
		(Re-entered from pens Nos. 5 and 51 last competition for second year test.)							
16	B. Kauffmann ...	White Leghorns (Eng.-Amer.)..	63	137	0	628	1310	5	6th
		(5 birds only; 1 died 18/11/11.)							
17	S. Smith	Brown Leghorns	38	79	10	459	941	12	19th
18	Mrs. H. H. Bright	White Leghorns (Aust.).......	36	70	13	590	1123	2	10th
		(4 birds only; 2 died 2/11/11.)							
19	N. Cole	Brown Leghorns..............	57	122	6	563	1181	10	8th
20	F. Molteno	White Leghorns (Amer.)	51	97	5	566	1046	6	18th
21	C. H. van Breda..	White Leghorns (Aust.)	67	128	13	723	1402	9	2nd
22	Mrs. C. H. van Breda	White Leghorns (Amer.).......	33	65	11	566	1101	13	11th
23	S. A. West.......	Brown Leghorns	35	65	14	557	1054	5	15th
24	Graham, Hope & Co.	White Wyandottes	60	121	2	608	1211	11	7th
25	R. V. R. Jones...	White Leghorns (Amer.-Aust.) .	37	74	10	467	913	9	20th
26	S. Smith	White Leghorns (Dan. & Amer.)	46	89	0	695	1330	12	4th

REPLACEMENTS (SCORES DEDUCTED FROM PEN TOTALS).

Pen No. 3.—No. 17 died. Replaced 23rd October. Score, 68 eggs; weight, 123 oz. 5 drms.

Pen No. 4.—No. 22 died. Replaced 4th November. Score, 62 eggs; weight, 110 oz. 14 drms.

Pen No. 5.—No. 28 died. Replaced 26th October. Score, 39 eggs; weight, 80 oz. 14 drms.

Pen No. 6.—No. 31 died. Replaced 22nd November. Score, 58 eggs; weight, 124 oz. 11 drms.

Pen No. 11.—No. 65 died. Replaced 3rd November. Score, 63 eggs; weight, 14 oz. 10 drms.
Pen No. 12.—No. 67 died. Replaced 28th September. Score, 38 eggs; weight, 78 oz. 4 drms.
Pen No. 19.—No. 112 died. Replaced 27th August. Score, 35 eggs; weight, 74 oz. 10 drms.

MANAGER'S REPORT FOR JANUARY, 1912.

The total number of eggs for the month is 1316, a drop, I regret to say, of 350 as compared with December; still, considering the number of birds that are moulting (some are laying through it), a drop is to be expected, although some birds have certainly not done their duty, for in each of six pens three birds have done all the work; in each of nine, four; and in only four pens—Nos. 13, 14, 21, and 24—have all six birds laid; uniformity of good layers in a pen entered in a laying competition is much to be desired, and this as a rule can only be achieved by choosing the daughters of one known particularly good layer.

The highest total of eggs in one day was 54, the lowest 29.

The pens with the highest totals of eggs are:—No. 14, 86; No. 4, 72; No. 15, 69; No. 21, 67; No. 13, 66; Nos. 6 and 16 (No. 16 five birds only), 63; No. 7, 62; and No. 24, 60.

The pens with the highest totals of weights are:—No. 14, 172 oz. 9 drms.; No. 15, 148 oz. 7 drms.; No. 13, 141 oz.; No. 4, 140 oz. 2 drms.; No. 16, 137 oz.; No. 6, 133 oz. 5 drms.; No. 21, 128 oz. 13 drms.; No. 19, 122 oz. 6 drms.; No. 24, 121 oz. 2 drms.

The highest individual scores in numbers of eggs are:—No. 89, 26 eggs; No. 120, 23; Nos. 62 and 105, 21 each; and Nos. 19, 56, 79, 94, and 99, 20 each.

And in weight:—No. 89, 58 oz. 4 drms.; No. 120, 46 oz. 8 drms.; No. 91, 44 oz. 2 drms.; No. 94, 43 oz.; No. 99, 42 oz. 3 drms.; No. 79, 41 oz. 8 drms.; No. 18, 39 oz. 4 drms.; No. 62, 39 oz. 4 drms.; No. 149, 39 oz. 4 drms.; No. 105, 39 oz. 3 drms.; No. 19, 39 oz. 1 drm.; and No. 56, 38 oz. 12 drms.

It will be seen that No. 89 again heads the list, both in number of eggs and weight, her 26 eggs averaging practically 2¼ oz. each.

The health of the birds during the month has been fairly good; a few are a trifle run down owing to the moult, but these are birds which lack good strong constitutions. The moult is an excellent diagnostic of this important quality.

There have been four cases of sickness, one of cerebral haemorrhage accompanied by paralysis, another of pulmonary haemorrhage, and two of bacillary enteritis. In the case of the first mentioned, when making one of my visits to the trap-nests, I discovered one of the birds almost unconscious, she was breathing heavily and her left side paralysed, indicating, of course, rupture of a blood-vessel on the right side of the brain. The other case of haemorrhage also occurred while the bird was in the nest; I discovered her with blood in the mouth and on the beak, and rattling in the throat on auscultation (sounding). I diagnosed the seat of the haemorrhage in the left lung. By the way, some may not know the method of auscultation of a fowl, for the benefit of these I will describe it. On raising the wing, a space underneath will be found free of feathers—hold this close to the ear, and should the bird be suffering from some disease of the lungs, the sound peculiar to it will be plainly heard (for instance in pleurisy it is exactly like the sound caused when the finger is rubbed over a piece of silk). To resume, in both these cases of haemorrhage the treatment was practically the same, application of cold water, in the first case to the head and in the other to the left side; a dose of chlorodyne—the best available drug I had at the time—to lessen the blood tension in the ruptured vessel, and isolation in as quiet and cool a spot as possible. The bird suffering from pulmonary haemorrhage recovered rapidly (the ruptured vessel evidently being a small one), and was returned cured to its pen in four days. In the other case, the haemorrhage soon ceased, but the paralysis is still present, though only in the leg and is improving. By far the greater number of deaths on the nest are due to haemorrhage (especially cerebral), and this is caused by increased blood tension in the vessels, due to a combination of circumstances, viz., heat, the strain of laying, and either an over-fatty condition or some hereditary weakness of the blood-vessels. The two birds affected are rather on the thin side, as all should be during the hot season. These two cases illustrate another of the advantages of using trap-nests, which have to be visited frequently; had they not been discovered in this condition they would have succumbed.

Of the two cases of enteritis, one recovered—although she was returned to her pen after six days' illness, she has not yet quite regained her normal strength and condition—the other I regret to say died; hers was a very rapid and virulent attack. I noticed in the late afternoon she was rather dull, was thirsty, not so eager for her food as usual, and in her eyes a frightened expression—all the premonitory symptoms of enteritis. She was immediately isolated and given a dose of chlorodyne and sweet oil; in a couple of hours she seemed better and brighter, in still another two hours she was worse and enteric

diarrhoea had developed. Another dose of chlorodyne and sweet oil was administered, with the result that at 11.30 p.m. she again showed improvement, but at 6 a.m. next morning I found she had died, and, judging from her condition, probably about 3 a.m. Many, when speaking of this complaint, quote cases in which the birds are said to go to roost in their usual health and are found dead next morning below the perches; in my opinion there is not much doubt but that in nearly every case the premonitory symptoms are present before the birds retire to roost, but they are not observed. While on the subject of disease, I should like briefly to allude to a case of appendicitis and peritonitis (due to wrong feeding) in a chicken of from two to three weeks old, which was brought to me for post-mortem examination a few days ago. Both appendices were much enlarged and full of undigested food, they were much inflamed, as was also the peritoneum and intestine adjacent to them; there was very little grit in the gizzard. On inquiry, I elicited the fact that the chicken had, as soon as hatched and dry, been fed with egg and bread-crumbs, and subsequently in addition to " Chikko ", with several feeds of soft food, consisting of bran, pollard, meat, and chopped cabbage daily. Now for the benefit of novices, I should like to say " *Never* give newly-hatched chicks *any* food for forty-eight hours, they require the whole of that time to digest the yolk of the egg, which they absorb into their systems just previous to exit from the shell. Put before them *only* coarse sand or chicken grit and some charcoal, and for the first meal give pinhead oatmeal dry (*never* give egg and breadcrumbs), and subsequently feed on ' Chikko ', and ' Chikko ' only, for the first three or four weeks, plus some chopped green food; soft food, especially if not very carefully mixed, or not a good sample, quickly turns sour in hot weather, even after it has been taken into the system. Above all, supply plenty of grit—half the bowel troubles in chickens are due to the lack of sufficient grit and charcoal."

About 75 per cent of the birds are moulting, the majority quickly and coming through it very well, but some, as I remarked above, are feeling the effects of it more than a strong bird should; about 10 per cent. are well over it.

Broodiness has again this month been very frequent and persistent, thirty-one birds being affected, two of these were Brown Leghorns and four White Leghorns. Five birds were each broody on two occasions during the month.

The weather on the whole has been favourable for the birds. There have been sixteen bright, hot, sunny days; on the 10th it was particularly hot (the temperature here in the houses and pens is in hot weather generally 2 or 3 degrees above that of the immediate surroundings), three days were close and sultry, and twelve cool. A slight shower of rain fell on two occasions only during the month; we have had south-east winds on twenty days, on five of which it was very severe, but the fowls owing to the position of the houses, feel little or nothing of it; it would benefit them greatly if they were more exposed to it and thus obtained more fresh air for they cannot have too much. My experience is that fowls thrive better, are stronger, and in more robust health (and therefore require a less amount of care and watchfulness), and also lay better on the top of a hill exposed to all the winds that blow, than when situated in a hollow where the air is stagnant, close and like that of a hothouse.

(Signed) ARTHUR LITTLE.
Manager.

School of Agriculture, Potchefstroom.

LORD METHUEN'S ADDRESS TO STUDENTS.

PRIOR to his departure from the Transvaal, Lord Methuen paid a farewell visit to the Experimental Farm and School of Agriculture, Potchefstroom, on 22nd January.

In introducing his Lordship to the students assembled in Selborne Hall, the General Manager (Mr. Alex. Holm) expressed the thanks of the department for the real and abiding interest which his Lordship had taken in the work of the institution, and referred to the fact that the School of Agriculture would for all time owe his Lordship a debt of gratitude for the opening ceremony performed by him a little more than a year ago.

Lord Methuen referred to his last address to the students of this school on the occasion of the opening of Selborne Hall by his Lordship himself. He recollected some words of advice he had given them then which had not been perfectly understood by the parents of some of them. He had expressed his belief that the good lads were sometimes in after life surpassed by those who had not led so steady a life at school; as he belonged to the latter class he had some sympathy with them. He never for one moment meant to say a word against the studious lads, but he pleaded that allowances might be made for the wildness of youth. He urged the students to have a second string to their bow, for one was apt to become narrow minded if one had no other thought in one's head beyond a profession.

It was not for him to discuss critically the curriculum of the school, but he might be allowed to venture the general criticism that the two years' period of residence seemed too short for the work which was undertaken. He suggested that the period should be extended by one year.

In the course of his former address to the pioneer students of the school, he had endeavoured to show them how necessary it was, right at the beginning of the institution, to set about creating a good tone and spirit in the place. Such a spirit formed the best tradition in a school, and he believed the name and reputation of a school depended principally upon its existence. He was pleased to be informed that it had taken root here. Once established it could maintain itself.

His Lordship then referred to some of the agricultural prospects and problems that would have to face the students when they set out to farm for themselves. Incidentally he pointed out that the liberal education in agriculture provided by the Government at this school placed upon them an obligation to take up the agricultural profession later on when they had left the College. It did not seem fair to gain the benefit of the Government education and make use

of it for some other profession which had nothing whatever to do with agriculture.

Co-operation between the farmer who comes out to South Africa with all modern ideas and the South African farmer who knows the land conditions was the secret of success. He instanced a case in the Orange Free State where from this cause land had more than doubled itself in value.

There were two matters in which he had always interested himself very much—the first, horse-breeding. He believed the conditions for breeding a certain type of horse were better in this country than in any other part of the world. This particular horse was the one that was required for military service. The climate and the nature of the country combined to produce the first essential—hardiness—and judicious breeding would bring shape, size, and bone. He believed the veld-bred South African horse had as sound a heart as any in the world. He particularized the Basuto pony, sprung from the ordinary Boer horse, and which through severe climatic conditions and mountainous country during seventy years in Basutoland, had become one of the hardiest ponies to be found anywhere. There would be a market for military horses in India shortly, as her supply from New South Wales was decreasing, and no country could supply a more suitable horse and at a more profitable return to the breeder than South Africa.

The second thing he was strong upon was forestry. He wondered if they knew how valuable the possession of timber woods made a country. Much had to be learnt in this respect in South Africa. There was room for trees on many farms, and he hoped they would make this an asset on their land when they set out to farm. He was pleased to note how much the importance of this matter was being recognized and to be informed that a course in forestry was to be provided at this school.

His Lordship then mentioned the compulsory military service scheme that was to be established in this country, and explained how the farmers would be affected. They must not, he said, look upon it as a hardship to be taught how to defend their farms. The force was to be a purely defensive one, and was a most necessary condition to the security of their land. No doubt they would be sometimes called upon to carry out their annual fortnight's field service at a time when the work on the farm would require their presence, but they might rest assured all would be done to meet their convenience so far as possible and must sacrifice the present need cheerfully for the greater good of their country.

His Lordship was accorded three hearty cheers by the students on the completion of his address.

Importation of Live Stock.

RETURN showing particulars of certain Pure-bred Live Stock imported into the Union of South Africa.

Stud-book No. or Name.	Breed and Stud-book in which Registered.	Sex.	Country of Origin.	Importers' Name and Address.
Unknown	Ass—Unknown	Jack	Spain	Smartt Syndicate, Britstown, C.P. (15/12/11.)
Unknown	Ass—Unknown	Jack	Spain	Dr. T. Graham, Trompsburg, O.F.S. (15/12/11.)
Lugeno, No. 48	Ass—Catalan (Spain)	Jack	France	W. Weyer, Wolvefontein, Uitenhage, C.P. (14/12/11.)
Elegant, No. 52	Ass—Catalan (Spain)	Jack	France	W. Weyer, Wolvefontein, Uitenhage, C.P. (14/12/11.)
Quday, No. 58	Ass—Catalan (Spain)	Jack	France	W. Weyer, Wolvefontein, Uitenhage, C.P. (14/12/11.)
Parthenia Butter-boy III, No. 67506	Holstein-Frisian of America	Bull	North America	G. R. Hobson, Maseru. (4/1/12.)
Belle Boon Wayne No. 141857	Holstein-Frisian of America	Cow	North America	G. R Hobson, Maseru. (4/1/12)
Artis Cornucopia De Kol	Holstein-Frisian of America	Cow	North America	G. R. Hobson, Maseru. (4/1/12.)
Impregnable	English Stud-book	Mare	U.K.	N. Brisley, Matatiele, East Griqualand. (22/1/12.)
Cora, No. 783	Weatherby's Stud-book, Vol. 21, p. 360	Mare	U.K.	E. Challenor, Durban. (11/12/11.)
Valide	Weatherby's Stud-book, Vol. 21, p. 835, and Vol. 22 when published	Mare	U.K.	T. Phillphott, Durban. (19/12/11.)
Ashmoor Freemason, No. 3856	Suffolk, Vol. 18	Stallion	U.K.	F. Wiseman, Dargle Road, Natal. (19/12/11.)
Brooke	General, Vol. 21	Stallion	U.K.	J. Kehery, Durban. (12/1/12.)
Telise	General, Vol. 21	Mare	U.K.	J. Kehery, Durban. (12/1/12.)
Unnamed	General, Vol. 21, and Vol. 22 when published	Filly	U.K.	J. Kehery, Durban. (12/1/12.)

Stud-book No. or Name.	Breed and Stud-book in which Registered.	Sex.	Country of Origin.	Importers' Name and Address.
Unnamed	General, Vol. 21 and Vol. 22 when published	Filly	U.K.	J. Kehery, Durban. (12/1/12.)
Unnamed	General, Vol. 21, p. 436	Stallion	U.K.	J. Kehery, Durban. (12/1/12.)
Unnamed	General, Vol. 22 when published	Filly	U.K.	J. Kehery, Durban. (12/1/12.
Dean Stanhope, No. 790	English, Vol. 20, p. 822	Stallion	U.K.	E. J. van Rooyen, Greytown, Natal. (18/1/12.)
Gladeye, No. 960	Polo pony—English, Vol. 22	Mare	U.K.	S. T. Amos, Merrivale, Natal. (22/1/12.)
Astree, No. 959	Polo pony—English, Vol 22	Mare	U.K.	S. T. Amos, Merrivale, Natal. (22/1/12)
Nabot Opera	English	Mare	U.K.	David Ward, Roma Hotel, Waterkant Street, Capetown. (19/2/12.)
Janet of Marlick	Clydesdale	Mare	U.K.	F. B. Morice, 151 Longmarket Street, Capetown. (12/2/12.)
Lord Gullane	Clydesdale	Stallion	U.K.	F. B. Morice, 151 Longmarket Street, Capetown. (12/2/12.)
Whirlwind	Thoroughbred—English	Filly	U.K.	F. B. Morice, 151 Longmarket Street, Capetown. (18/1/12.)
Gleesome	Thoroughbred—English	Filly	U.K.	F. B. Morice, 151 Longmarket Street, Capetown. (18/1/12.)
Alcassin	Thoroughbred—English	Stallion	U.K.	F. B. Morice, 151 Longmarket Street, Capetown. (18/1/12.)
Chillington	Thoroughbred—English	Stallion	U.K.	F. B. Morice, 151 Longmarket Street, Capetown. (18/1/12.)
Open Sesame	Thoroughbred—English	Filly	U.K.	F. B. Morice, 151 Longmarket Street, Capetown. (18/1/12.)
Adbolton Major, No. 11317	Hackney (Vol. XXVIII)	Stallion	U.K.	W. H. Lombard, Kombuisland, Marquard, O.F.S. (9/2/12.)
Adbolton Pelonius, No. 11318	Hackney (Vol. XXVIII)	Stallion	U.K.	W. H. Lombard, Kombuisland, Marquard, O.F.S. (9/2/12.)

Export of Fresh Fruit.

RETURNS FOR JANUARY, 1912.

STATEMENT showing the description and declared value of fresh fruit exported from the Union of South Africa during the month ended 31st January, 1912, distinguishing port of shipment.

DESCRIPTION.	Via Capetown.	Via Port Elizabeth.	Via East London	Via Durban	Via Delagoa Bay.	Via Other Routes	TOTAL.
	£	£	£	£	£	£	£
Apples	3	1	—	—	12	—	16
Apricots.........	97	—	—	—	1	—	98
Bananas	20	—	1	—	—	—	21
Grapes	297	—	—	—	44	—	341
Lemons	1	—	—	—	—	—	1
Nectarines	589	—	—	—	3	—	592
Nuts	3	—	—	—	—	—	3
Oranges	14	—	3	—	2	—	19
Peaches	2,793	—	—	—	37	—	2,830
Pears	3,896	—	—	—	39	6	3,941
Pineapples.......	10	6	—	61	—	1	78
Plums	2,624	29	—	—	58	—	2,711
All Other........	119	—	—	1	81	—	201
TOTAL......£	10,466	36	4	62	277	7	10,852

Export of Maize.

RETURN showing quantity of Maize (in bags) exported through various ports of the Union of South Africa during the month of January, 1912.

Origin, etc.	White, Flat.			Yellow, Flat.		White, Round.		Yellow, Round.		Mixed.		Below Grade.	Totals.
	1	2	3	4	5	6	7	8	9	Flat. 10	Round. 11	12	
Via Port Elizabeth—													
Orange Free State.....	—	1,778	—	—	330	—	—	—	1,397	37	75	—	3,617
Transvaal............	—	370	—	—	187	—	—	—	12	14	15	—	598
Total..........	—	2,148	—	—	517	—	—	—	1,409	51	90	—	4,215
Via Durban—													
Natal..................	—	—	—	—	—	—	—	—	139	—	—	—	139
Orange Free State.....	—	671	100	—	—	—	—	—	5,383	—	—	—	6,154
Transvaal............	—	6,130	—	—	—	—	—	—	—	—	—	—	6,130
Total..........	—	6,801	100	—	—	—	—	—	5,522	—	—	—	12,423
Via East London—													
Orange Free State.....	—	105	—	—	—	—	—	—	—	—	—	—	105
Transvaal............	—	288	—	—	—	—	—	—	—	—	—	—	288
Cape Province.........	—	140	—	—	—	—	—	—	—	—	—	—	140
Total..........	—	533	—	—	—	—	—	—	—	—	—	—	533

Outbreaks of Animal Diseases.

THE following outbreaks of scheduled infectious and contagious animal diseases have occurred in the areas specified during the month ended 31st January, 1912:—

CAPE PROVINCE PROPER.

(EXCLUDING TRANSKEIAN TERRITORIES.)

Anthrax.

District.	Area.	Number of Deaths.	Number of In-contact Animals.
Alexandria........	Good Hope Farm............	1	60
Barkly West............	Daniel's Kuil...............	9	Unknown
,, ...	Delpoort's Hope............	1	,,
Britstown....	Smartt's Syndicate...........	14	,,
East London............	Cambridge....................	1	,,
,, ...	Section 4, Farm No. 306......	1	,,
Hay.........	Cone: 0·82.................	1	,,
Herschel................	Msindo's Location............	—	20
,, ...	Bensendale Location..........	2	60
Kuruman..........	Kuruman.....................	1	Unknown
,, ...	,, ...	1	,,
,, ...	Farm Mamathan (Langberg) ..	2	1900
Kingwilliamstown.........	Janteni's Location............	1	61
,, ...	Mhlambiso's Location.........	1	Unknown
Mafeking......	Moshesh's Farm..............	Unknown	,,
Namaqualand............	Bitterputs Farm..............	10	,,
Vryburg.................	Commonage..................	Unknown	,,
,, ...	Middelkop Farm.............	1	120

Glanders.

District.	Area.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of Contacts Tested.
Kimberley...........	Du Toits Pan........	—	1	3
Kingwilliamstown.....	Farm No. 36, Punzana	2	—	1
Ladismith............	Ladismith............	1	3	50

Scabies (Equines).

District.	Area.	Number Infected.	Number of In-contact Animals.
Albany..................	Grahamstown Commonage.....	3	12
Graaff-Reinet.............	Graaff-Reinet.................	3	3
Stockenstrom.............	Lushington, Seymour.........	1	1
,, ...	Bergmanshoek, Seymour......	3	3

Tuberculosis.

District.	Area.	Number of Animals Tested.	Number of Reactions to Test.	Number of Doubtful Reactions.
Cape	Various	165	4	5
Malmesbury	"	75	—	—
Paarl	"	80	1	—
Stellenbosch	"	72	1	—

TRANSKEI, TEMBULAND, AND WESTERN PONDOLAND.

East Coast Fever.

District.	Name of Location.	Number of Deaths.	Number of In-contacts.
Kentani	Gadeni's Location	25	700
Libode	Nongotwana's Location	—	618
"	Marikazi's Location	—	164
Ngqeleni	Sonaba's Location	—	—
"	Lindinxiwa's Location	—	—
"	Gwadiso's Location	36	3000
Port St. Johns	Zintonga's Location	1	32
"	Diko's Location	45	47
"	Ndeva's Location	1	32
Tsolo	Joel Ntuli Location	—	—
"	Victor's Location	—	—
"	Bunga Farm	1	200
"	Ntibane Farm	—	
Mqanduli	Noah's Location	—	—
"	Hlobo Location	—	—
Willowvale	Commonage	—	—
"	Jekeni's Location	—	
"	Bikitsha's Location	—	—
"	Sunduza's Location	—	—
"	Mbangeni's Location	—	—
"	Mboyiya's Location	—	—
"	Fundakubi's Location	—	—

Lung-sickness.

District.	Name of Location.	Number of Deaths.	Number of In-contacts.
Libode	Siqitine	1	—
Mqanduli	David Noah	1	—
Tsolo	—	1	—
Willowvale	Vetbooi	4	—
Engcobo	Mgudlwa	3	—
"	Ndlela	2	—
"	Sitoza	3	—
"	Ntaka	2	—

Anthrax.

District.	Name of Location.	Number of Deaths.	Number of In-contacts.
Umtata	Gobolondwana	1	—
”	”	1	—
”	”	1	—
”	”	1	—
”	”	1	—
Kentani	Gaga	1	—
Umtata	Mgqekeswein	1	—
Idutywa	Mabulawa	1	—
”	Bangiso	1	—
”	Mqoncu	1	—
Kentani	Nkente	1	—
Idutywa	Mdyojolo	1	—
”	Qiqa	1	—
”	Hlobo	1	—
Butterworth	Veldman	1	—
Umtata	Gobondwana	1	—
Idutywa	Dinizulu	1	—
”	”	1	—
Engcobo	Sotyato	1	—
Umtata	Tyalibongo	1	—
Idutywa	Poswa	1	—
Qumbu	—	1	—
Idutywa	Dinizulu	1	—
”	(Transport)	—	—
”	Sofika	1	—
Umtata	Balizulu	1	
”	Gobolondwana	1	—

Mange in Equines.—Nil.
Epizootic Lymphangitis.—Nil.
Tuberculosis.—Nil.

NATAL.

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Alexandra Division	Location No. 3	1	12
Alfred Division	Addington	1	22
”	The Pastures	11	20
”	Paardekraal	5	124
Ladysmith Division	Goedgedacht	30	351
”	Doornkloof	70	40
Lions River Division	Woodlands	1	2
Lower Umzimkulu	Perbeck	6	37
”	The Wold	6	1
Zululand (Melmoth)	Prospect Estate	3	72
” (Mahlabatini)	Mahlabatini	1	3
Estcourt	Groote Melie Tuin	3	160

Anthrax.—No outbreaks.
Epizootic Lymphangitis.—No outbreaks.
Glanders.—No outbreaks.
Mange in Equines.—No outbreaks.
Tuberculosis.—Umlazi Division. Salvation Army Farm. Full report not yet to hand.

TRANSVAAL.

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Zoutpansburg	M'Phtlel's Location	1	—
Pretoria	Twoefontein	1	—
Krugersdorp	Florida Town	6	—
Lichtenburg	Town	1	—
"	Kunana Location	1	—

Glanders.

District.	Name of Farm.	Clinically affected. Destroyed.	Reacted to Test and Destroyed.	Number of Contacts.
Witwatersrand	54 Commissioner Street	—	1	Nil
"	Vogelfontein No. 337	1	—	5
"	Indian Location	—	1	—
Wakkerstroom	Chance No. 53	2	—	25
Piet Retief	Town Lands	2	1	—

Tuberculosis.

District.	Name of Farm.	Number of Animals Tested.	Number of Reactions to Test.	Number of Doubtful Reactions.
Pretoria	Pretoria Town	1	1	—

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Piet Retief	Driefontein (portion of Welgekozen No. 75	3	40
Zoutpansberg	Pietersburg Town Lands	1	—

ORANGE FREE STATE.

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of Contacts.
Harrismith	Planen No. 850	1 goat	Indefinite.
Ladybrand	Palmyra	1 horse	None.
Bethlehem	Keighley	1 beast	No information.

Glanders.

District.	Farm or Place.	Clinically Destroyed.	Reacted. Destroyed.	Contacts Tested.
Frankfort..........	Erf No. 91, Frankfort.	—	1	2
,, ...	Kaalplaats No 324....	—	2	8
,, ...	The Hague..........	—	1	7

Contagious Abortion.

District.	Farm.	Contacts.	Number Aborted.	Remarks.
Bloemfontein........	Grootvlei Government Farm	18	7	Somewhat doubtful.

THE following outbreaks have occurred during the month ended 29th February, 1912 :—

CAPE.

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Bathurst..................	Trappes Valley..............	—	—
East London.............	Chiselhurst..................	1	—
Gordonia..................	Obobogovop, Ward 6.........	40	—
Kingwilliamstown..........	Hanshaw Location...........	1	—
,, ...	Rhododo's Location..........	1	—
,, ...	Izeli.................... ...	1	—
,, ...	Fort White..................	1	—
,, ...	Debe Marela's Location.......	1	—
,, ...	Schultz's Farm..............	3	—
Khomga..................	Lot No. 13, Keikop..........	2	30
,, ...	Lot No. 17, Keikop..........	2	29
Mafeking................	Sellagoli....................	20	—
Stutterheim...............	Quoin.......................	1	—

East Coast Fever.

East London.............	Farm No. 63, Ward 3........	2	80
Kingwilliamstown..........	Mlagalaga's Location..........	2	353

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of Contacts Tested.
Aliwal North..........	Klipfontein.........	1	—	—
Cathcart..............	Highlands............	2	—	2
„	Fenfield.............	—	2	6
„	Cape Potsdam........	1	—	6
Ladismith.............	Wilgeriver	1	—	50
Swellendam...........	Barrydale...	1	4	25

Lung-sickness.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Komgha.......	No. 275...................	1	—

Mange in Equines.

Cape....................	Wynberg..................	1 animal affected	—

Tuberculosis.

District.	Name of Farm	Number of Animals Tested.	Number of Reactions.	Number of Doubtful Reactions.
Cape......	-	155	--	5
Malmesbury...........	—	57	1	--
Paarl.................	--	35	3	—
Stellenbosch...........	—	43	1	1
Colesberg..	Arundel.............	10	1	—

TRANSKEI TERRITORIES.

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Idutywa..................	Gwantshu....................	5	420
„	Mbeka.......................	4	1474
„	Mtambabi....................	2	316
„	Matumbu....................	154	1774
„	Mpuluse.....................	1	15
„	Mamba's Location...........	—	—

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Lusikisiki..................	Commonage.................	1	124
,, ...	Mgwili......	2	42
,, ...	Mtono......................	25	178
,, ...	Nomondindi	18	43
,, ...	Johnson's Location..........	—	—
,, ...	Mswaki's Location...........	—	—
Umtata..................	Balizulu's Location...........	—	—
,, ...	Remainder Buli's Location....	—	—
,, ...	Commonage............. ...	1	576
,, ...	Waterfall Farm..............	–	70
,, ...	Hillside Farm...............	1	69
Mount Frere...	Zibokwana.......	2	45
,, ...	Ngogwana.............. ..	2	49
Bizana..................	Gozulu....	3	330
Mount Ayliff.............	Mbizweni..	1	61
,, ...	Ngcani (suspected)	—	—
Engcobo...	Xolilizwan Location..........	—	—
,, ...	Part of Zibi's Location.	—	—
Umzimkulu..	Gowan Lea..................	-	—
,, ...	Ensikini Mission Reserve	-	—
Ngqueleni..........	Luntshu....................	1	27
,, ...	Sigibi......................	1	7
,, ...	Poni's Location.............	—	—
,, ...	Simangu's Location...........	—	—
Kentani....	Maki's Location.......	—	—
Port St. Johns..	Clarke's Farm...............	1	—
,, ...	Eastern Bank................	4	—
Libode...........	Mbekedana's Location.........	–	—
,, ...	Benson's Location............	–	—
,, ...	Zondwaya's Location.........	–	–
Flagstaff.....	Mblangana's Location.......	—	—

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed	Number of Contacts Tested.
Idutywa..............	Mpuluse.............	1	—	42

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Mount Frere..............	Commonage................ .	1	12
,, ...	Talanga....................	4	—
Umtata..................	Balizulu's Location..........	–	—
,, ...	Nkandeli's Location..........	—	—
Kentani..................	Maki's Location..............	—	—
Idutywa..................	Piswa's Location.............	—	—

Lung-sickness.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Tsolo	Qurana Farm	—	—
	and Location	5	176
Engcobo	Nonzusa	2	271
	Another portion	2	231
Sizidi	Ndleta	3	131
"	Yawa	1	149
"	Mutonintshi	4	105
"	Mgotyana	1	54
"	Sitiza's Location	—	—
"	Mtshangala's Location	—	—
Kentani	Fynn's Location	1	14
Butterworth	Alepn	3	47

NATAL.

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Alexandra	The Pheasantries	3	113
"	Lot T. 8	1	67
"	Crowder	—	—
"	The Walk	—	—
Alfred	Staffords	18	188
"	Uplands	2	40
"	Wickham	—	—
"	Broomsgrove No. 2	—	—
"	The Pines	—	—
"	Orange Grove	—	—
Bergville	Haartebeeste	2	24
"	Shirley	1	3
Dundee	E. of Menteith	—	—
"	Brookleigh	—	—
Impendhle	Hilda	—	—
Ladysmith	New Forest	—	—
"	Eenvogelvlei	5	139
"	Gevonden	10	890
Lions River	Rietvallei	—	—
"	Bossie	5	200
Lower Umzimkulu	Mount Zion	—	—
"	Barrow Green	—	—
"	West Slopes	—	—
Newcastle	The Nook	—	—
Ngotshe	Vaalhoek	—	—
Paulpietersburg	Vlakplaats	—	—
Utrecht	Berouw	—	—
Richmond	Illovo Nek	1	60
"	Dunbar	—	—
"	Lincolnville	—	—
Vryheid	Welgevonden	—	—
"	Breezie Braes	—	—
Weener	Vriesgewacht	—	—
"	Cicilia	—	—

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Lions River..............	Woodfield....................	2	325
,, ...	The Falls....................	4	104
Richmond............	Howard Hill.................	9	300

Epizootic Lymphangitis.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Inanda......	Nonoti.................	1	5
Victoria County...........	Stanger.....................	—	—
,, ...	Verulam................	—	—

TRANSVAAL

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Waterberg..	Vlakfontein.......	1	43

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Krugersdorp.	Florida Town.............. .	6	—
,, ...	South Randfontein G.M.......	1	—
Lichtenburg..............	Lichtenburg Town........	1	—
,, ...	Kanana's Location........ ...	1	—
Ermelo......	Kromdraai No. 69............	3	—
Marico...................	Zendelingspost No. 268.......	1	—
Wakkerstroom....... ...	Witkoppies No. 10......... .	1	—
Christiana.............. .	Welgedaan......	1	—
Carolina.................	Nooitgedacht.............. .	1	—

Tuberculosis.

District.	Name of Farm.	Number of Animals Tested.	Number of Reactions.	Number of Doubtful Reactions.
Krugersdorp..........	Elands Vlei..........	1	1	—
Pretoria...............	Pretoria Town.......	1	1	—
Middelburg...........	Pan.................	1	1	—

Epizootic Lymphangitis.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Waterberg................	Marcus Masibi's Location.....	1 (animal slaughtered)	—

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of Contacts Tested.
Witwatersrand........	49 Fox Street........	1	8	—

ORANGE FREE STATE.

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Bloemfontein..............	Tempe Cantonments........ ..	1	—
Kroonstad............. ...	Plancius...	1	—

Mange in Equines.

Bloemfontein...	Dewetsdorp..........	—	—

Glanders.

District	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of Contacts Tested.
Thaba 'Nchu..........	Cranbourne..........	1	-	6
Frankfort.............	Rooikop.............	-	1	5

Notes on the Weather.

NATAL PROVINCE.—JANUARY.

THE following notes have been taken on a general survey of the meteorological returns for the year 1911 received from the Natal recording stations. The highest shade temperature recorded was on 18th October at Verulam, 114° F.; and the lowest was 8° F. at Nottingham Road on 28th June. The highest monthly mean maximum temperature was that for December at Estcourt, 98·1°; the lowest monthly mean minimum was 22·6° for the month of July at Nottingham Road. Verulam has also the distinction of heading the list of heavy rainfalls; on 1st October 16·17 inches were reported to have been collected, and the total there for the same month was 27·28 inches which fell on 14 days.

TEMPERATURE (NATAL), JANUARY.

STATION.	Mean Maximum.	Mean Minimum.	Monthly Mean.	Abs. Maximum.	Abs. Minimum.	Mean Daily Range.
	°	°	°	°	°	°
Observatory, Durban	82·4	68·3	75·3	90	61	14·1
Stanger	85·5	65·0	75·3	109	60	20·5
Verulam	87·6	68·2	77·9	104	61	19·4
Hillary	80·3	67·2	73·7	97	60	13·1
Umbogintwini	84·2	66·4	75·3	95	55	17·8
Winkle Spruit	80·7	66·3	73·5	95	58	14·4
Umzinto	94·0	56·2	75·1	104	53	37·8
Port Shepstone	81·9	66·2	74·0	92	58	15·7
Imbizana	82·5	65·1	74·0	98	54	17·1
Mid-Illovo	75·4	60·7	68·1	101	54	14·7
Bulwer	72·2	56·0	64·1	87	44	16·2
Himeville	80·3	54·0	67·1	95	45	26·3
Richmond	79·5	59·5	69·5	98	52	20·0
Pietermaritzburg	82·6	61·4	72·0	104	54	21·2
Howick	81·9	59·1	70·5	98	52	22·8
Cedara Vlei	78·9	56·3	67·6	95	51	22·6
New Hanover	88·1	61·0	74·6	103	50	27·1
Greytown	84·2	56·1	70·1	100	49	28·1
Krantzkops	89·6	66·0	77·8	98	50	23·6
Lidgetton	84·0	47·4	65·7	98	41	36·6
Nottingham Road	82·2	52·3	67·3	98	47	29·9
Estcourt	101·4	59·8	80·6	105	54	41·6
Weenen	96·6	60·3	78·4	110	55	36·3
Mpofana	85·9	61·4	73·7	104	53	24·5
Ladysmith	94·7	63·5	79·1	106	57	31·2
Dundee	88·7	62·2	75·5	101	55	26·5
Newcastle	91·0	54·8	72·9	103	45	36·2
Vryheid	84·1	59·7	71·9	98	52	24·4
Paulpietersburg	89·8	58·6	74·2	96	55	31·2
Ngomi Forest	75·9	57·7	66·8	89	52	18·2
Ingwavuma	87·4	62·9	75·1	102	55	24·5
Ubombo	81·0	68·0	74·5	99	60	13·0
Hlabisa	82·8	68·0	75·4	92	60	14·8
Mahlabatini	81·3	52·7	67·0	95	44	28·6
Melmoth	81·1	60·3	70·7	102	56	20·8
Empangeni	87·6	66·8	77·2	103	62	20·8
Mtunzini	88·1	52·9	70·5	101	46	35·2
Amatikulu	86·8	67·8	77·3	106	63	19·0
MEANS	84·8	61·0	72·9	—	—	23·8
EXTREMES	—	—	—	110	41	—

The wettest month, however, was November, when there were 27 wet days (9·39 inches) at Ngomi Forest. This is, of course, a particularly moist locality, and it should be added that during the same month there were 26 wet days (4·20 inches) at Mid-Illovo. The mean daily shade temperature throughout the year (from an average of 35 recording stations) was 65° F, the hottest month being February (73°), and the coolest June (55·5°). The mean monthly rainfall (from an average of 38 stations) was 3·54 inches, falling on 8·6 days a month. October showed by far the largest precipitation owing to the exceptional downpour on the 1st, and gives an average of 8·38 inches, while June and July are bracketed lowest, both showing an average of 0·36 inch. It is not suggested that these figures, either as regards temperature or rainfall, are fully representative of the conditions throughout the Province, they can but be approximations. The distribution of the recording stations was roughly as follows:—ten along the coast from Empangeni to Imbizana, nine in the Midlands, eleven on the Highlands, and five in the interior of Zululand.

The month of January was on the whole rather dry and few heavy rains were experienced. The heaviest precipitation for the month was 11·13 inches registered at Newcastle, of which 6·05 inches fell on the 5th. In the northern districts the 5th was the wettest day, 4·51 inches fell at Paulpietersburg and 4·75 inches at Vryheid. The only other heavy rains were on the 14th, when 5·11 inches fell at Krantzkop and 3·07 inches at Bulwer. Hail was also reported from Bulwer on this date, where otherwise the month was very dry and crops were suffering. The average rainfall for the month was: on the coast 3·66 inches falling on 10 days, in the Midlands 4·58 inches on 14 days, on the Highlands 5·96 inches also on 14 days, and in the interior of Zululand 5·03 inches on 11 days. Thunderstorms were neither particularly frequent nor violent for the season, and the worst spell of broken weather reported was between the 2nd and the 9th at Nottingham Road, which period was stormy and wet.

At the Observatory, Durban, the mean barometric pressure during January was 30·018 inches, which is above the average for twenty years by ·036 inches; while the mean temperature was 75·35°, or ·7° below the average.

OBSERVERS' NOTES.

Imbizana.—Rainfall this month has only reached 2·08 inches, very light for January; it has kept the planted crops growing but has been bad for late ploughings. With favourable weather during February and March the crops in the district should not be much below the average in yield per acre, but owing to the shortage of labour the acreage planted is smaller than usual. Stock is looking very well. The temperature for the month has been above the average, but not as high as most inland places. (C. H. Mitchell.)

Mid-Illovo.—Rain totalling 3·52 inches was registered on 18 days during the month, very little over half an inch being registered on any one day. The temperature has not been excessively hot for the time of year; Tuesday the 23rd, however, brought a hot wind and the thermometer in most places was well over 100° in the shade: there was also a hot wind on the 21st. The mealie crop is fairly good in this district, not having suffered from drought so much as in other parts, and with favourable weather a fair crop may be expected. North of this, and in some of the adjacent valleys, however, the drought has caused sad havoc, more especially amongst the native crops. Further cases of horse-sickness continue to be reported, and farmers are paying attention to the smoking of their stables. (J. W. V. Montgomery.)

Nottingham Road.—Very great heat in the day-time still continues, and the northern parts of the district are suffering from drought. Horse-sickness has started earlier than usual, and horses are dying even on the high districts. Fruit is small through lack of rain; berries are plentiful.

Ladysmith.—The droughty period experienced during the greater portion of December, and which had occasioned much anxiety among the farming community and the natives, broke up with a rain totalling 1·66 inches from the 4th to 6th January. The subsequent rainfall brought the total for the month up to 2·83 inches, as compared with 5·23 for January, 1911. The damage to the mealie crop will be considerably reduced in all probability, but the natives are very gloomy as regards their prospects of being able to raise a food supply this season. The mean maximum and minimum temperatures for the month were considerably higher than those for January, 1911. (J. C. Haycroft.)

Ngomi Forest.—During the month rain was recorded on 21 days, with a total rainfall of 9·86 inches, which is a little lower than January, 1911 (11·31 inches), and a little higher than January, 1910 (8·30 inches). Taking the month all through, it has been a pleasant warm month. Mealies in this part are looking well; the only fault is that mealies are not gone in for on a larger scale. Several horses have died from horse-sickness; one or two have died in places where horse-sickness had never been known to exist. (W. H. Foster.)

Mpofana.—Still very hot and dry in thorns, fair rains in other parts. Possible revival of late mealie crop on the higher lands. Mabele crop showing signs of decided improvement. Moderate storms; no casualties or damage to crops reported. (L. H. Conyngham.)

Nongoma.—Rain fell during 11 days, the total amounting to 3·34 inches. The heaviest fall was on the 5th, amounting to ·80 inch. The rains appear to have been general in northern Zululand. The 1st was by far the hottest day of the month, but owing to the thermometers having been broken, it was not possible to ascertain the exact temperature. There were two or three thunderstorms during the month, but no really heavy rain fell. During the earlier part of January horse-sickness was very prevalent in northern Zululand, and no less than ten deaths have come to notice from this and surrounding districts. (T. R. Bennett, jun.)

Empangeni.—The weather has been very hot and dry, as from the 16th to the 27th, when nice rains fell just in time to save the situation. On the 21st and 23rd the heat was very great together with hot north winds, scorching everything up. Stock and crops continue to look well in the district, and there are few cases of horse-sickness. Locusts are now a thing of the past. (H. Tarboton.)

TRANSVAAL.—JANUARY.

SUMMARY.—The month has been an exceptionally dry one; generally there was no rain from about the middle to near the end of the month. Most districts experienced a rainfall much below their average, the only exceptions being Bethal, Ermelo, Middelburg, and Potchefstroom. The season's rainfall (seven months), except in the vicinity of Klerksdorp, shows a deficit in all parts of the Province. This deficit is considerable and serious, except over the districts of Potchefstroom, Ermelo, and Middelburg. Thus Pretoria has a rainfall of under 11 inches instead of over 18, and Johannesburg of 12 inches instead of 18.

OBSERVERS' WEATHER REPORTS.

BETHAL DISTRICT—

Leeuwkuilen.—The month of January has been a most erratic one; two rainless periods were experienced, viz., from 5th to 14th and from 17th to 27th; the heat was intense and the grass scorched up during these periods. Both stock and crops suffered about this time. The heat was greater than I have ever known it in the twenty-four years experienced in the Transvaal. Judging by the state of the veld, one would not imagine that nearly 4 inches of rain had fallen during the month. Thunderstorms have prevailed and no set-in rain has yet come, which is unusual for the time of the year. (W. J. Wayland.)

BLOEMHOF DISTRICT—

Zevenfontein.—Excessive heat was experienced during the month of January. (Edwards Bros.)

Zoutpan.—Hot winds and heat have been the great feature of the month. Crops suffered badly for want of rain. (W. G. C. Andrews.)

CAROLINA DISTRICT—

Lower Goedverwacht.—All rainfalls were accompanied by thunderstorms; no hail; from 18th to 27th inclusive very warm weather was experienced. Crops affected. (J. T. W. Archibald.)

ERMELO DISTRICT—

Amsterdam.—The month of January has been a very hot one. (J. Naude.)

LYDENBURG DISTRICT—

Belfast.—An exceptionally dry month. Vlei grounds, in parts, were white with frost on the mornings of the 12th, 21st, 23rd, and 24th. (G. J. Imrie.)

Graskop.—Nice rains fell in the early part of the month, but a very dry spell occurred from the 17th to the 27th. Mists were frequent. (G. Irvine.)

MIDDELBURG DISTRICT—

Middelburg.—The rainfall of 5·91 inches is half an inch greater than the average for the month for the past nine years. The feature has been the long intervals of eight and ten days between the falls at the beginning, middle, and end of the month which promised to ruin the rapidly growing crops. This was, however, averted by the timely reappearance of the rain, and all anxiety is now removed as to the failure of crops for the district, which in many cases will be quite up to the average. The prevailing wind was from north-east and gentle. No hail was reported anywhere. (Dr. H. A. Spencer.)

POTCHEFSTROOM DISTRICT—

Strathmore.—Very hot, dry weather was experienced this month. (C. Scott.)

PRETORIA DISTRICT—

The Wilderness.—An exceptionally dry month for this time of year; total failure of mealie crop in this district; heat excessive. Pasture very poor. Aapies River has ceased flowing at this point. (F. R. Grindley Ferris, J.P.)

Wagendrift.—Many very hot days were experienced during the month; more rain is badly wanted. (F. Garforth.)

RUSTENBURG DISTRICT—

Rustenburg.—Although there has been a total rainfall during the month of nearly 3¾ inches, over a period of nine days, it has been of little or no benefit to the farming community, and beyond freshening up the grass has done nothing towards advancing the crops. Water is very scarce throughout the district; spruits and dams are dry, and the Elands River, one of the chief feeders of the district, has ceased to flow for the greater part of its length. (Superintendent D. Allam, T.P.)

STANDERTON DISTRICT—

Standerton.—The features of the month were clear mornings and very warm days. The drought has been very severe in the town and district, and the crops are suffering very severely. The Vaal River is also very low. (A. von Backstrom.)

SWAZILAND—

M'Pundwini, No'Mahasha.—This is the driest season we have here for at least twenty years; as a rule we have a good rainfall every season on No'Mahasha Mountains. (G. Munro.)

WATERBERG DISTRICT—

Geelhoutkop.—From the 21st to 28th of the month excessive heat was experienced during the day, with a strong wind from 10 p.m. to daylight. (E. Cochrane.)

Illawarra.—Very hot windy weather was experienced this month. Crops suffered very much for want of more rain. (J. A. Manson.)

ZOUTPANSBERG DISTRICT—

Louis Trichardt.—A fairly good rainfall was experienced during the month, but it was very local in character, and there are many wide tracts of country in the neighbourhood where the drought of December has been practically unbroken. Generally speaking, a serious deficiency in native crops, of mealies especially, is inevitable, and prices locally have already risen from 60 to 70 per cent. in anticipation. (Sergeant J. C. N. Clark, T.P.)

Mamathola.—The weather during this month has been hot; the rain fell mostly in local showers, some places in the vicinity getting very little. Owing to the dry spell, the crops generally will be small. (H. W. Molyneux.)

ORANGE FREE STATE.

SUMMARY OF METEOROLOGICAL OBSERVATIONS.—DECEMBER.

(A)—MEANS.

STATION	Barometer	Dry.	Wet	Dew Point.	Rel. Hum	Max.	Min.	Mean.	Range
	Inches.	°	°	°	%	°	°	°	°
Ben Avis........	—	—	—	—	—	—	—	—	—
Bethulie...........	25·743	77·5	62·3	51·8	41	91·8	53·3	72·6	38·5
Bloemfontein.......	25·440	75·6	60·4	49·7	40	91·4	60·2	75·8	31·2
Grootkuil...... ...	—	74·7	59·3	48·3	39	93·5	56·7	75·1	36·8
Harrismith.........	—	—	—	—	—	—	—	—	—
Holfontein.........	—	75·7	67·6	61·9	62	91·7	57·2	74·9	34·5
Imperani..........	—	71·1	58·7	49·7	46	87·0	56·7	71·8	30·3
Ladybrand.........	—	72·5	61·3	53·0	49	84·9	54·4	69·7	30·5
Lindley............	25·157	71·7	61·6	54·1	54	88·4	58·0	73·2	30·6
Modderpoort.......	24·796	72·3	60·4	51·4	48	85·3	53·0	69·2	32·3
Tweespruit.........	25·046	74·0	64·0	56·7	55	89·7	51·5	70·6	38·2
Vierfontein.........	—	75·1	69·1	64·8	70	89·4	59·2	64·3	30·2

(B)—EXTREMES.

STATION.	BAROMETER.		TEMPERATURE.	
	Maximum.	Minimum.	Maximum.	Minimum.
	Inches.	Inches.	°	°
Ben Avis......	—	—	—	—
Bethulie.......	26 018 on 7th	25 ·589 on 13th	100 ·8 on 20th	40 0 on 15th
Bloemfontein...	25 ·610 on 6th	25 ·330 on 26th	98 ·2 on 20th	53 ·8 on 22nd
Grootkuil......	--	—	100 ·2 on 26th	35 ·0 on 22nd
Harrismith.....		--	—	—
Holfontein.....	—	—	100 ·2 on 22nd	50 ·0 on 14th
Imperani......		—	94 ·7 on 31st	50 ·0 on 15th
Ladybrand.....	..	--	93 ·5 on 20th	43 ·9 on 2nd
Lindley......	25 ·303 on 6th	25 088 on 16th	95 ·7 on 25th	50 ·0 on 14th
Modderpoort...	24 ·941 on 6th	24 ·727 on 27th	92 ·9 on 31st	45 ·0 on 15th
Tweespruit.....	25 ·111 on 6th	24 ·846 on 27th	98 ·8 on 26th	40 ·0 on 4th
Vierfontein.....	—	—	98 ·1 on 26th	50 ·0 on 15th

JANUARY.

(A)—MEANS.

STATION.	Barometer	Dry.	Wet.	Dew Point	Rel. Hum	Max	Min	Mean	Range
	Inches	°	°	°	%	°	°	°	°
Ben Avis......... ...	-	70 ·6	59 ·0	49 ·8	48	87 ·3	57 5	72 ·4	29 ·8
Bethulie...........	25 838	74 1	62 ·8	54 ·8	51	90 ·8	61 ·2	76 ·0	29 ·6
Bloemfontein.......	25 ·492	72 8	63 ·0	55 ·5	54	89 ·3	62 9	76 ·1	26 ·4
Grootkuil......... .	--	73 ·7	61 ·2	52 ·4	48	91 ·1		—	-
Harrismith....	—	68 7	---	--	--	79 ·6	53 2	66 4	26 ·4
Holfontein...... .	–	75 ·8	64 8	57 ·0	52	88 4	60 1	74 3	28 3
Imperani..........	—	70 0	60 3	52 6	53	85 ·4	58 8	72 ·1	26 ·6
Ladybrand.........	—	69 2	61 ·4	56 2	61	83 1	56 ·4	69 ·7	26 ·7
Lindley.	25 ·214	70 1	61 ·1	54 ·2	57	85 9	59 ·4	72 6	26 ·5
Modderpoort... ..	25 ·856	70 7	60 ·5	52 9	53	85 ·5	55 6	70 ·5	29 9
Tweespruit..	-	—	—	—		—	—	—	—
Vierfontein.......	—	73 6	64 ·8	58 ·2	59	87 4	61 2	74 ·3	26 ·2

(B)—EXTREMES.

STATION.	BAROMETER.		TEMPERATURE.	
	Maximum.	Minimum.	Maximum.	Minimum.
	Inches.	Inches.	°	°
Ben Avis.... .	—	—	95 ·1 on 11th	40 ·0 on 17th
Bethulie.....	25 ·979 on 10th	25 ·708 on 31st	100 2 on 11th	43 ·9 on 17th
Bloemfontein...	25 ·643 on 10th	25 ·372 on 31st	98 ·8 on 2nd	46 ·5 on 16th
Grootkuil......	---	--	101 ·2 on 1st	—
Harrismith.....	--	—	91 ·3 on 1st	41 ·7 on 17th
Holfontein.....		--	100 ·4 on 1st	47 ·0 on 15th
Imperani......	--	--	96 ·4 on 1st	46 ·1 on 17th
Ladybrand.....	—	..	93 ·0 on 1st	42 ·0 on 15th
Lindley........	25 ·347 on 10th	25 ·036 on 15th	97 ·6 on 1st	51 ·0 on 16th and 17th
Modderpoort...	24 ·950 on 10th	24 ·687 on 15th	94 ·3 on 1st	42 ·0 on 17th
Tweespruit.....	—	—	—	—
Vierfontein.....	—	—	96 ·1 on 1st	49 ·0 on 16th

Rainfall Returns.

NATAL—JANUARY.

	Inches.
Durban (Observatory)	2·96
Do. (Point)	3·55
Stanger	4·07
Verulam	3·32
Hillary	2·61
Umbogintwini	3·96
Winkle Spruit	3·39
Umzinto	1·57
Port Shepstone	3·23
Imbizana	2·08
Harding	3·33
Mid-Illovo	3·52
Bulwer	7·23
Himeville	4·76
Richmond	5·41
Pietermaritzburg	3·68
Howick	3·73
Cedara (Vlei)	4·24
New Hanover	5·00
Greytown	4·37
Krantzkop	9·30
Lidgetton	6·39
Nottingham Road	3·47
Estcourt	2·45
Weenen	3·18
Mpofana	1·89
Ladysmith	2·83
Dundee	3·80
Newcastle	1 ·13
Utrecht	7·80
Vryheid	7·95
Paulpietersburg	7·87
Ngomi Forest	9·86
Ingwavuma	6·26
Ubombo	4·37
Nongoma	3·34
Hlabisa	7·60
Mahlabatini	5·20
Melmoth	3·40
Empangeni	4·34
Mtunzini	6·53
Amatikulu	5·93

TRANSVAAL—JANUARY.

	Inches.
Barberton	3·10
Komatipoort	2·58
Bethal	5·21
Christiana	1·18
Carolina	4·21
Ermelo	5·31
De Hoop	6·32
Heidelberg	3·90
Vereeniging	2·42
Lichtenburg	2·71
Pilgrims Rest	6·83
Belfast	2·50
Zeerust	2·77
Middelburg	5·91
Potchefstroom	5·69
Klerksdorp	5·40
Arcadia (Pretoria)	1·62
Modderfontein	2·19
Rustenburg	3·71
Standerton	2·52
Wakkerstroom	3·32
Volksrust	5·38
Potgietersrust	1·45
Krugersdorp	4·99
Joubert Park (Witwatersrand)	3·40
Observatory	2·83
Pietersburg	0·83
Louis Trichardt	4·46
Leydsdorp	2·34

ORANGE FREE STATE—DECEMBER.

	Inches.
Bethlehem District:	
Abersethin	1·57
Bellevue	1·75
Kaallaagte	2·47
Kestell	4·62
Middelpunt	5·19
Novo	1·39
Reitz	4·31
Whinburn	1·50
Rondehoek	1·71
Bethulie District:	
Town	0·13
Bloemfontein District:	
The City—	
Government Laboratories	0·12
Grey College School	0·31
St. Michael's School	0·17
Dewetsdorp	0·20
Mazelspoort	0·40

BLOEMFONTEIN DISTRICT (*contd.*):	*Inches.*
Nieuwjaarsfontein	0·15
Tempe	0·24
Roodepoort	0·03
Waaihoek	0·20
BOSHOF DISTRICT:	
Beginseldam	0·69
Brakfontein	0·15
Dealesville	0·17
Eagels Nest	0·38
Kanonfontein	1·02
Knapdaar	1·52
Mahemsvley	1·10
Smithskraal	0·24
Nooitgedacht	0·07
FICKSBURG DISTRICT	
Caledon Draai	3·05
Dekselfontein	2·24
Dunblane	1·51
Gunton	5·05
Imperani	1·16
Kalkoenkrantz	3·68
Kranskloof	1·37
Lusthof	1·11
Prynnsberg	2·07
Zuikerkop	2·00
Kirklington	2·83
Dunelm	1·18
FRANKFORT DISTRICT	
Town	2·18
Dunedin	1·84
Muirton	1·62
Voorspoed	1·31
Waterford	1·93
Hebron	0·54
Vierfontein Mine	2·13
HARRISMITH DISTRICT	
Afrika's Kop	2·31
Arbeid Adelt	1·01
Buckland Downs	1·95
Tandjesberg	2·18
Mill Barton	2·10
Hermitage	3·14
HEILBRON DISTRICT:	
Brereton	3·10
Honing Kloof	1·92
Kroonbank	1·80
Maccauvlei	1·87
HOOPSTAD DISTRICT:	
Town	0·13
Fairfield	1·21
Rietkuil	0·10
Roodepoort	0·18
JACOBSDAL DISTRICT:	
Koppieskraal	0·43

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KROONSTAD DISTRICT:	*Inches.*
Town	1·15
Congleton	1·07
Geduldfontein	1·49
Gelukfontein	1·29
Holfontein	1·32
LADYBRAND DISTRICT.	
Alma	1·40
Braemar	1·45
Clocolan	1·95
Government Nursery	2·60
Lambertina	1·91
Mona	1·58
Westminster	1·35
Zorgvliet	1·25
Rangershoek	1·74
Modderpoort	1·49
LINDLEY DISTRICT.	
Town	0·88
Kerry	1·47
Lindley Road	1·47
Waterford	1·08
Wexford	1·13
PHILIPPOLIS DISTRICT:	
Highbury	0·01
ROUXVILLE DISTRICT:	
Town	0·72
Cleanwater	1·17
Middelplaats	0·47
Sterkfontein	0·50
THABA 'NCHU DISTRICT	
Burgundy	1·40
Carrigholt	2·13
Mount Stephen	1·26
Tweespruit	0·77
Wilgeboom Nek	0·69
York	1·21
VREDE DISTRICT.	
Woudzicht	2·61
VREDEFORT DISTRICT:	
Bloemhof	0·94
The Grange	2·14
WEPENER DISTRICT:	
Mon Repos	2·12
Wonderboom	2·11
Zamenloop	1·30
WINBURG DISTRICT:	
Town	0·40
Beddington	0·58
Burnet Holm	0·56
Grootkuil	0·16
Hayfield	0·79
Paardekraal	1·41
Roodekop	0·93
Wildebeestefontein	0·65
Excelsior	1·61
Klipfontein	0·80

ORANGE FREE STATE—JANUARY.

BETHLEHEM DISTRICT :	*Inches.*
Abersethin	2·33
Bellevue	5·02
Clifton	1·49
Kaallaagte	3·43
Middelpunt	4·25
Novo	2·46
Reitz	5·03
Rondehoek	0·85
Stolzkop	1·25
Whinburn	2·47
Kestell	3·08

BETHULIE DISTRICT :	
Town	0·27
Abercairn	2·42
Excelsior	0·39
Niet-te-Weet	0·39
Priors	0·60

BLOEMFONTEIN DISTRICT	
Town :—	
Arboretum	0·89
Government Laboratories	0·79
Grey College School	1·01
Hamilton Park	0·81
St Michael's School	0·87
Abrahamskraal	0·62
Bayswater	0·88
Dewetsdorp	1·04
Donkerhoek	1·07
Doornplaat	0·75
Dunmanway	0·41
Ellerslie North	1·27
Glen Lyon	0·95
Hillandale	0·70
Holmlands	0·86
Kelvedon	0·91
Kuilput	0·93
Mazelspoort	1·27
Mooiplaats	0·53
Nieuwjaarsfontein	0·97
Pakpoort	0·66
Platkop	0·80
Reddersburg	1·02
Retreat	0·96
Riversford	0·92
Roodepoort	0·91
Sannah's Post	0·52
Tempe	1·04
The Willows	1·03
Waaihoek	1·10

BOSHOF DISTRICT :	
Nooitgedacht	1·56
Beginseldam	0·79
Brakfontein	0·63
Dealesville	0·28
Eagles Nest	0·54
Kalkpan	0·69
Kanonfontein	1·94
Knapdaar	0·99
Mahemsvley	0·87

EDENBURG DISTRICT :	*Inches.*
Excelsior	1·34

FAURESMITH DISTRICT :	
Brakdam	0·79
Klipnek	1·15
Koffyfontein	0·47
Middelfontein	0·81
Mimosa	1·37
Newlands	1·16

FICKSBURG DISTRICT :	
Bosrand	2·63
Caledon Draai	1·14
Dekselfontein	1·87
Dunblane	3·07
Fouriesburg	1·83
Gunton	3·15
Imperani	1·89
Kalkoenkrantz	3·51
Kirklington	2·80
Kranskloof	2·60
Lusthof	3·12
Platkop	1·89
Prynnsberg	1·38
Sandford	2·14
Zuikerkop	1·22

FRANKFORT DISTRICT	
Town	2·19
Belladale	1·32
Dunedin	4·04
Muirton	2·62
Vryheid	2·41

HARRISMITH DISTRICT	
Arbeid Adelt	3·68
Afrika's Kop	1·91
Buckland Downs	2·35
Forest Station	2·81
Hartebeestefontein	1·97
Hermitage	2·16
King's Hill	2·08
Mill Barton	3·49
Tandjesberg	1·77

HEILBRON DISTRICT :	
Brereton	1·92
Honing Kloof	3·19
Kroonbank	3·63
Maccauvlei	2·97
Springbokvlakte	3·50

HOOPSTAD DISTRICT :	
Town	5·22
Commando Drift	2·29
Klippan	2·70
Vooruitzicht	1·05

JACOBSDAL DISTRICT:	Inches.
Town	0·75
Aschboschdam	1·12
Aurora	1·02
Zoutpan	0·49
Koppieskraal	0·35

KROONSTAD DISTRICT:	
Town	2·69
Geduldfontein	3·83
Gelukfontein	4·11
Hebron	3·47
Holfontein	2·36
Vierfontein Mine	6·04
Voorspoed Mine	5·93
Waterford	2·67
Cransbrooke	0·30

LADYBRAND DISTRICT:	
Town	2·32
Alma	1·12
Braemar	1·66
Clocolan	1·38
Government Nursery	2·08
Lambertina	1·03
Modderpoort	2·19
Moria	1·70
New Vale	2·07
Rangershoek	2·19
Westminster	1·93
Zorgvliet	1·36
Leeuw River Mills	1·49

LINDLEY DISTRICT:	
Town	3·10
Kerry	2·90
Lindley Road	2·14
Waterford	2·63
Wexford	2·73

PHILIPPOLIS DISTRICT:	
Donkerpoort	0·60
Highbury	1·11
Karreefontein	0·96
Krielsfontein	0·86
Langkuil	0·45

ROUXVILLE DISTRICT:	Inches.
Town	2·27
Ben Avis	2·30
La Mortola	4·48
Middelplaats	2·54
Oudefontein	0·86
Ramelies	3·30
Sterkfontein	1·85
Wheatlands	4·63

THABA 'NCHU DISTRICT:	
Town	1·92
Branksome	2·33
Burgundy	1·78
Carrigholt	1·71
Fort Bassett	2·72
Groot Hoek	2·34
Likatlong	0·73
Mount Stephen	1·40
Ramalitsi	0·88
Strathearn	3·42
Wilgeboom Nek	2·41
York	1·82
Rockwood	1·10

VREDE DISTRICT:	
Town	3·34
Woudzicht	3·08

WEPENER DISTRICT:	
Alkmaat	0·20
Meander	2·10
Wonderboom	2·54
Kalkfontein	1·63

WINBURG DISTRICT:	
Town	0·79
Bantry	1·63
Beddington	1·69
Burnet Holm	1·23
Excelsior	1·14
Foxhill	1·50
Grootkuil	1·27
Hayfield	2·24
Paardekraal	1·74
Roodekop	1·29
Smaldeel	2·25
Vaalbankskuil	1·20

Agricultural Show Dates, 1912.

CAPE PROVINCE.

Britstown.—Friday, 15th March.
Somerset East.—Friday and Saturday, 15th and 16th March.
Aliwal North.—Tuesday and Wednesday, 19th and 20th March.
Humansdorp.—Thursday and Friday, 21st and 22nd March.
Grahamstown.—Thursday and Friday, 21st and 22nd March.
Barkly East.—Friday and Saturday, 22nd and 23rd March.
Port Elizabeth.—Tuesday, Wednesday, Thursday, and Friday, 26th to 29th March.

NATAL PROVINCE.

Newcastle.—Thursday and Friday, 6th and 7th June.
Vryheid.—Tuesday, 11th June.
Dundee.—Thursday and Friday, 13th and 14th June.
Klip River (Ladysmith).—Tuesday and Wednesday, 18th and 19th June.
Weenen (Estcourt).—Thursday and Friday, 20th and 21st June.
Umvoti (Greytown).—Thursday and Friday, 20th and 21st June.
Lion's River.—Tuesday, 25th June.
Maritzburg.—Thursday, Friday, and Saturday, 27th, 28th, and 29th June.
Durban.—Wednesday, Thursday, and Friday, 3rd, 4th, and 5th July.
Lower Umzimkulu (Port Shepstone).—Tuesday, 9th July.
Stanger.—Wednesday, 10th July.
Camperdown.—Thursday, 25th July.
New Hanover.—Wednesday, 24th July.
Richmond.—Unfixed.
Ixopo.—Unfixed.
Noodsberg Road.—Unfixed.

TRANSVAAL PROVINCE.

Lydenburg.—March (date not fixed).
Heidelberg.—Wednesday and Thursday, 27th and 28th March.
Standerton.—Tuesday and Wednesday, 2nd and 3rd April.
Pretoria.—Tuesday, Wednesday, and Thursday, 2nd, 3rd, and 4th April.
Johannesburg (Witwatersrand).—Wednesday, Thursday, Friday, and Saturday, 10th, 11th, 12th, and 13th April.
Potchefstroom.—Wednesday, 24th April.
Wolmaransstad.—Wednesday, 15th May.

ORANGE FREE STATE PROVINCE.

Bethlehem.—Wednesday and Thursday, 20th and 21st March.
Boshof.—Wednesday and Thursday, 20th and 21st March.
Kroonstad.—Tuesday and Wednesday, 26th and 27th March.
Ficksburg.—Tuesday and Wednesday, 26th and 27th March.
Heilbron.—Wednesday and Thursday, 27th and 28th March.
Philippolis.—Thursday, 28th March.
Winburg.—Wednesday and Thursday, 3rd and 4th April.
Frankfort.—Tuesday and Wednesday, 9th and 10th April.
Clocolan and Marquard.—Wednesday, 10th April.
Bloemfontein.—Tuesday, Wednesday, and Thursday, 16th, 17th, and 18th April.

Farm Employment.

A young man, strong and healthy, 17 years of age, seeks employment on a large progressive farm as an improver, with a view of getting a sound practical knowledge of farming. Advertiser speaks both English and Dutch, and has had practical experience as a farm hand for six months.—Apply FARMER, P.O. Box 87, Pretoria. [12]

Young man, 25 years of age, seeks employment as foreman or general working man on a farm. Sober, strong, healthy, not afraid of work. Knowledge of mixed farming; testimonials. Speaks Dutch and English.—G. J. ROSSOUW, c/o H. Vaughan-Williams, Driefontein, Clocolan, O.F.S. [1]

Young man seeks employment on farm, with a view to learning farming. Speaks English and Dutch.—V. HAUTEKIET, Nieuport, Bains, Belgium. [2]

South African Produce Markets.

CAPETOWN.

The Produce Department of the firm of R. Müller, Capetown, reports under date of the 26th of February as follows, viz. :—

Ostrich Feathers.—At the beginning of this month the London sales were held. Best feathers were eagerly competed for. For lower grades the demand was rather slow. In all, feathers were knocked down to the value of £218,000. Whites and feminas of best quality advanced up to 15 per cent. Second whites kept steady. Common grades of whites proved irregular. Dark feminas were firm; light second feminas easier. Byocks showed a decline of 10 per cent. Spadonas advanced up to 15 per cent. White boos were steady. Light boos went up 2½ per cent. Dark boos advanced 15 per cent. Long and medium blacks declined by 15 per cent. Short blacks remained unchanged. Long and medium drabs were 10 per cent. cheaper, whilst medium and short drabs were very firm. Large floss were irregular. Medium and short floss went up 10 per cent.

The Capetown market was well supplied. Fair quantities were disposed of by public auction and others out of hand. All round, it may be said that the sales were effected in favour of sellers, which is to a great extent to be accounted for by the local manufacture, whereby sellers benefit considerably. Feathers of exceptionally good quality were offered recently, and in this direction progress may be chronicled. The following are the prices ruling at Capetown now, viz. :—

	£	s.	d.		£	s.	d.
Primes	18	0	0	to	28	0	0
First	12	10	0	„	17	0	0
Second whites	8	0	0	„	11	0	0
Third whites	4	0	0	„	7	10	0
Inferior and stalky whites	1	10	0	„	3	10	0
Byocks and fancy	2	0	0	„	8	0	0
Superior feminas	10	0	0	„	14	10	0
First feminas	7	10	0	„	9	10	0
Second feminas	4	0	0	„	6	0	0
Third feminas	1	10	0	„	3	10	0
Greys	1	10	0	„	8	0	0
White boos	1	0	0	„	3	0	0
Light boos	0	12	6	„	2	0	0
Dark boos	0	3	0	„	0	15	0
Inferior boos and tipless	0	1	0	„	0	17	6

	£	s.	d.		£	s.	d.
Long blacks	3	0	0	to	8	0	0
Medium blacks	2	0	0	„	3	15	0
Short blacks	0	8	0	„	1	5	0
Long floss black	1	7	6	„	2	10	0
Medium floss black	0	12	6	„	1	5	0
Short floss black	0	7	6	„	0	10	0
Long drabs	2	10	0	„	4	0	0
Medium drabs	0	10	0	„	1	5	0
Short drabs	0	3	0	„	0	7	6
Long floss drabs	1	7	6	„	2	0	0
Medium floss drabs	0	12	6	„	0	17	6
Short floss drabs	0	5	0	„	0	8	0
Inferior long blacks and drabs	0	15	0	„	1	15	0
Common blacks and drabs	0	1	0	„	0	5	0
Spadonas	0	10	0	„	3	0	0

Wool.—The wool sales closing in London beginning of this month showed an easier tendency, although the attendance was large and competition spirited. Keen demand existed for superior and medium grades of wool, specially for the German and American trade. Snow white superior African wool remained unchanged. Snow white medium and inferior, as well as grease combing light, showed ½d. decline. Grease combings receded by ½d., but prices for grease clothing light and grease clothing heavy remained unchanged.

The offerings in Capetown were not up to much, neither in quality nor in quantity, and consequently intending purchasers could not execute their orders. Larger supplies are expected shortly. Prices now ruling are as follows, viz. :—

	d.		d.
Calvinia, long	5¾	to	6½
Calvinia, short to medium	5	„	5¾
Karoo and Roggeveld, long	6½	„	8
Karoo, heavy	5½	„	6½
Malmesbury and Piquetberg Lambs	4	to	5
C and C	4½	„	5
Inferior to medium	2	„	4½

Skins.—At the beginning of this month sales were held in London. The tendency was irregular; attendance and competition good. Fully previous prices were paid for

extra long wool and long wool skins. Short wool and short skins realized ¼d. less. Lamb skins were unchanged; dry damaged up to ¼d. decline. For coarse wool skins an advance up to ½d. was paid.

On the 22nd instant, the report of the London Cape goat skin sales announced an average attendance. Heavy and medium weights, generally, light and extra light weights, also dry damaged, were not well competed for, which resulted in a decline amounting to ¼d., respectively ½d. Bastards remained steady. Capetown and Western Province heavy and medium weights were in excellent demand, previous values being fully realized. Light weights were also well competed for. Prices remained unchanged.

Skins now realize in Capetown, as follows, viz.:—

Goatskins, light	13½d. per lb.	Short wools	4d. per lb.
Goatskins, heavy	10½d. per lb.	Pelts and damaged	3d. per lb.
Angoras	7d. per lb.	Bastards	4¾d. per lb.
Angoras, bastard	10d. per lb.	Capes, large	3s. 0d. each.
Long wools, Caledon	5½d. per lb.	Capes, medium	2s. 3d. each.
Long wools, grassveld	5¼d. per lb.	Capes, cut	1s. 3d. each.
Long wools, Karoo	5d. per lb.	Small and damaged	0s. 7d. each.

PORT ELIZABETH.

Messrs. John Daverin & Co. report as follows under date 26th February:—

Ostrich Feathers.—A large quantity has again been disposed of on the local feather market during the month of February; the total quantity for the four weeks just ended being 35,739 lb., and the amount realized £73,110.

New goods are only coming forward slowly, the plucking season not having commenced yet, and the recent sales have therefore reduced stocks to a very moderate amount. At the moment, there cannot be much more than about £50,000 value on hand here, and this quantity may probably be still further reduced in another month's time, after which the new season's goods may be expected to begin to arrive in large quantities.

At the London sales, which took place at the end of last month, an advance in prices was quoted on best whites and feminas, but our London correspondents are careful to advise us that the demand for these goods was not for actual trade requirements, but rather in anticipation of an improvement in the trade demand. Most other descriptions either remained unchanged at the close of the sales, or showed some decline.

On our local market, primes and superior feminas have advanced in price—in fact, good qualities in general are in fair demand, and realize satisfactory prices. On the other hand, all descriptions from very common up to fair average quality have become if anything weaker, and are only sold with difficulty. This applies more particularly to common and narrow wings, including whites, feminas, greys, and fancies, and also to common and ordinary long blacks and drabs.

Owners, however, have now become more accustomed to the lower level of prices for these descriptions, and there have been comparatively few withdrawals from our market.

As far as the future is concerned, it is expected that the demand will run mainly on *quality*, and it is considered that the prospects for really desirable qualities are not unfavourable, but it is feared that there is little probability of much improvement in prices on the lower grades. The lowness of stocks at this side cannot have much effect upon the market generally, as not only is a large increase in the supply expected shortly, but there are considerable quantities still available in the London warehouses.

The Continental demand, we are pleased to be able to report, continues very satisfactory, but there are no signs of any improvement in the demand in America. Should this latter occur, we would hope for a general improvement in prices, but until it does, the best we can hope for is a maintenance of present rates.

The following are approximate current values of unsorted pluckings, per line:—

	Whites.			*Feminas.*		
	£ s. d.		£ s. d.	£ s. d.		£ s. d.
Super	8 0 0	to	11 0 0	5 10 0	to	7 10 0
Good	6 0 0	„	7 10 0	4 10 0	„	5 5 0
Average	5 0 0	„	6 0 0	3 0 0	„	4 0 0
Poor average	3 15 0	„	4 10 0	2 0 0	„	3 0 0
Common and inferior	2 15 0	„	3 10 0	1 10 0	„	2 0 0

	Tails.			*Blacks.*			*Drabs.*		
	s. d.		s. d.	s. d.		s. d.	s. d.		s. d.
Good to super	12 6	to	25 0	25 0	to	55 0	15 0	to	22 6
Average	7 6	„	10 0	14 0	„	16 0	8 0	„	11 0
Poor	4 0	„	7 0	10 0	„	12 6	5 0	„	7 0

	Spadonas.		Chicks.
	s. d.	s. d.	d. s.
Super lots................	25 0 to	50 0	6 to 5
Average lots..............	15 0 ,,	25 0	
Common....................	2 6 ,,	7 6	

Wool.—The market during the past month has presented no feature that calls for special comment. Business on the whole has been on a restricted scale, in a great measure undoubtedly due to commercial unrest, owing to the unsettled state of the labour market.

The threatened strike among woolcombers has been fortunately averted, but until a more favourable aspect of the impending coal strike is noticeable, the greatest caution on the part of buyers will no doubt prevail, and it is therefore difficult to get extreme values, except for the very best conditioned wools; but unfortunately the bulk of the stock held here at present cannot be classified under this heading, and it is impossible to reconcile the up-country costs of these wools with their market values, the difference in some instances being pence per pound.

The second series of London wool sales open on the 5th March, and as far as we can gather, there is no prospect of any improvement in values within the near future.

The unsatisfactory state of the market was noticeably reflected on our weekly catalogue sales, where out of 15,532 bales offered during the month, only the very small proportion of 3239 bales were sold. The sales throughout lacked spirit in the biddings, but there is no gainsaying the fact that most of the offerings were composed of heavy conditioned wools which are difficult to move, except at very low prices. The total stock held here at present is very moderate, comprising as it does about 7000 bales.

The following are current rates for:—

	d.		d.
Snowwhite extra superior......	18½	to	19½
,, superior...........	17	,,	18
,, good to superior....	16	,,	16½
,, inferior faulty......	13	,,	15
Grease, super long, well-conditioned, grassveld grown (special clips)..............	9	,,	10
Grease, super long, grassveld grown.....................	7½	,,	8½
Grease, super long, Karoo grown (special clips).........	7½	,,	8
Grease, super long, Karoo grown	6¾	,,	7½
Grease, super long, mixed veld	6¼	,,	7¼
Grease, light, faultless, medium, grassveld grown............	6	,,	6½
Grease, light, faultless, medium, Karoo grown	6	,,	6½
Grease, light, faultless, short, Karoo grown	5¼	,,	6
Light Karoo lambs	6	,,	6½
Cross-bred grease	5½	to	6½
Cross-bred scoured............	12½	,,	14
Grease, coarse and coloured...	4	,,	5¼
Scoured ,, ,,	3	,,	8
Basuto grease, short	5½	,,	5¾
O.F.S. grassveld grease, long and well-conditioned (special clips)......................	7	,,	7½
O.F.S grassveld grease, long and well-conditioned...........	6	,,	6¾
O.F.S. grassveld medium grown, light, with little fault.......	5½	,,	6¼
O.F.S. grassveld short, faulty and wasty.....	4	,,	5
O.F.S. Karoo grown, long and well-conditioned............	6	,,	6¼
O.F.S. medium grown, light, with little fault............	5	,,	5½
O.F.S. short, faulty, and wasty.	4	,,	4½

Mohair.—The situation is practically unchanged since the date of our previous report and, as is almost usual at this time of the year, no transactions of importance have taken place. There have been inquiries for summer first and kids' hair, but at such prices which would not tempt holders to part with their stock.

Our London correspondents describe the market there as "lifeless", only urgent requirements are being filled, and consider the outlook as by no means encouraging.

The total stock held here at present represents about 2500 bales firsts, about 700 bales kids' hair, and about 300 bales mixed, or about 3500 bales in all.

In the absence of actual sales we give the following as nominal values of:—

	d.		d.
Super kids..................	19	to	20
Ordinary kids and stained.....	14	,,	16
Superior firsts, special clips....	11	,,	11½
Ordinary firsts...............	10	,,	10½
Short firsts and stained.......	9	,,	9½
Superfine long blue O.F.S. hair.	12	,,	12½
Mixed O.F.S. hair (average) ..	9½	to	10½
Mixed O.F.S. hair, very mixed.	7	to	9
Seconds and grey............	5	,,	7½
Locks......................	4¾	,,	5
Winter kids, special clips.....	13½	,,	14
,, good ordinary....	11	,,	12
Winter hair, short to full-grown	8	,,	8½
Basuto hair.................	9½	,,	10½

Skins.—Sheepskins, 4¾d. per lb.; damaged, 3¾d. per lb.; pelts, 3d. per lb.; damaged, 1½d per lb. Hair capes, 2s. 7d.; sundried, 1s. 6d. each; cut, 1s. each; damaged, 6d. each.

Coarse wools, 4½d. per lb. Goat, 13¼d. per lb.; heavy, 10¼d. per lb.; sundried, 11¼d. per lb.; damaged, 6d. per lb. Bastards, 10½d. per lb.; damaged, 4d. per lb. Angora, 8¼d. per lb.; sundried and heavy, 7¼d.; shorn, 6d. per lb.; damaged, 3d. per lb. Springbok, 9d. each. Johannesburg sheep, 4d; damaged sheep, 3d.; pelts, 2¼d.; goat, 10¼d.; damaged, 5¼d.; angora, 6¾d.; damaged, 2¼d. per lb.

Hides.—Sundried, 9¾d.; damaged, 8¾d.; salted, 8½d.; damaged, 7½d.

Horns.—3½d. each all round.

EAST LONDON.

Messrs. Malcomess & Co., Ltd., East London, report as follows, under date 28th February:—

Our report of the 31st ultimo was closely followed by the close of the first series of Colonial wool sales of this year in London, when—

Long super combing grease were quoted...........	5 per cent. lower;
Long heavy combing grease were quoted..........	5 per cent. lower;
Short grease were quoted........................	5 per cent. lower;
Snowwhites were quoted.........................	½d. lower;

while out of the total offerings of approximately 185,000 bales, only 12,000 bales Australians and 2000 bales Capes were held for the next series, which represent a very substantial consumptive energy on the part of the trade on a market that was not wholly satisfactory. America showed a slightly better inquiry, but confined its purchases chiefly to crossbreds.

The beginning of the month found tops in Bradford receding to outside 24½d., with cable news reporting a declining tendency for long wools. Since then the market has been, like all markets of the world, adversely affected by the fear of a general coal strike and the terrible industrial chaos caused by the closing down of factories, etc., which would result. The Continental market business was none too satisfactory either, and it must be recorded that right through prices in the Colonies have been considerably above European parity, and it still remains to be seen how those purchases and prices will be justified when the wools come on to the combs.

The second series of London Colonial wool sales commences on Tuesday 5th March, with offerings of 191,500 bales coming under the hammer, of which 16,500 bales are South African. The result depends largely on the settlement or otherwise of the coal strike.

The local market has right through the month shown the same characteristics, viz. a keen demand for all clips of good light condition and clean sound staple, while the heavier wastier parcels were often left on one side. This is likely to be the case just so long as light wools are obtainable; when these are cleared then buyers will be forced to come into the market for heavier varieties, and unless the coal strike comes to a head and causes a general disorganization of trade and slump in price, we think it not impossible that prices may firm up a little during March to the advantage of holders of heavy wools.

Anyway, for the time being heavy greases are a drag on the market, and it is useless trying to force sales.

Local public auctions show the following result:—

31st January	—5,080 offered	1,350 sold.	Sales for the week, 3,500
7th February	—4,100 offered	1,400 sold.	Sales for the week, 2,500
14th February	—3,080 offered	1,100 sold.	Sales for the week, 2,000
21st February	—2,800 offered	1,100 sold.	Sales for the week, 3,000
28th February	—2,800 offered	1,400 sold.	Sales for the week, 3,000
			140,000

which can be said to equal fully 15,000 bales cleared during the month, leaving stocks about 17,000.

We quote as follows:—

	d.		d.
Transkeis....................	5¾	to	6¾
Basuto nativ grease..........	5	,,	5⅝
Ordinary native grease.......	5	,,	5½
Super long-skirted Kaffrarian farmers (nominal)..........	8	,,	10¾
Super short-skirted Kaffrarian farmers (nominal)..........	7	,,	8½
Good long-grassveld, well-conditioned....................	6	to	8
Good short grassveld, well-conditioned..................	5	,,	6½
Long northern O.F.S.........	6	,,	7½
Long southern O.F.S..........	4½	,,	6½
Short faulty grease..........	4	,,	5½
Coarse and coloured grease.....	2½	,,	4½

***Mohair.*—This market is absolutely stagnant on this side, and at Home also spinners are doing nothing, filling only their most immediate requirements in a hand-to-mouth manner. We quote :—**

Superior kids	17d. to 19d.	Average long blue	10d. to 11d.
Average kids	15d. „ 18d.	Mixed, O.F.S.	9d. „ 10d.
Winter kids	10d. „ 12d.	Seconds and greys	5d. „ 6d.
Winter hair	7d. „ 8½d.	Thirds	4½d. „ 5d.
Super long blue	11d. „ 12d.	Basuto	9d. „ 10½d.

These valuations are absolutely nominal, and the prices are not always obtainable.

Sundry Produce.—This market has shown considerable weakness for sheepskins and goatskins, and in London sales prices were considerably lower. Added to this, the quality of consignments coming in is considerably worse, with the result that prices here have receded :—Hides, S.D. 9¼d. to 9¾d. ; D.S. 7¾d. to 8¼d. Goats, 12¼d. to 12½d. Angoras, 8½d. to 9d. Sheep, woolled skins, 4½d. to 4¾d ; coarse-woolled, 4d. ; pelts, 2½d. to 2¾d. ; Transkei parcels, 3½d.

DURBAN.

Messrs. Reid & Acutt's Wool Mart, Ltd., Esplanade, Durban, report as follows under date 27th February :—

In our last report, dated 30th January, 1912, we advised that the market was weaker with a downward tendency, and we regret to say that, during the month now closed, this dulness has become increasingly evident, and to-day the market is very weak and unsettled, with values from ½d. to ¾d. below the level current at the beginning of the year.

The last fortnight has seen practically the close of the long wool season here, and so far lambs and short wools have not reached market in any quantity.

The heavy drop in wool values, and the uncertainty of the outlook is, without doubt, due to the pending labour troubles at Home, and until prospects in this respect become better we are afraid we cannot expect to see more life in the market.

The London March sales open there on the 5th of that month, and by that time it is to be hoped that some settlement will have been come to in the industrial situation, and if this is so, we feel sure that wool values will immediately show some improvement.

In any case, the opening of the auctions will serve to let the trade know exactly where they stand, and this is to be welcomed in view of the present state of weakness and doubt.

The following are prices current here to-day :—

NATAL AND EAST GRIQUALAND.

Midlands. (Nominal).	d.		d.
Long light sorted clips	10	to	11½
Unsorted clips, light and clean	8½	„	10
Short to medium lambs	6	„	7
Medium to long lambs	7	„	8

Ladysmith, Newcastle, Dundee, etc.			
12 months' sorted clips, light and clean	8	to	9
12 months' average clips, light and clean	7	„	8
6 to 9 months' average clips, light and clean	6	„	6½
Short to medium lambs	6	„	6¾
Medium to long lambs	6½	„	7½

Utrecht and Vryheid.	d.		d.
12 months' sorted clips, light and clean	7½	to	8½
12 months' average clips, light and clean	6½	„	7
6 to 9 months' average clips, light and clean	5½	„	6½
Short to medium lambs	5½	„	6½
Medium to long lambs	6½	„	7½

East Griqualand.			
12 months' sorted clips, light and clean	8	to	8½
12 months' average clips, light and clean	7	„	7½
6 to 9 months' average clips, light and clean	6	„	6½
Short to medium lambs	5½	„	6½
Medium to long lambs	6½	„	7

TRANSVAAL.

Volksrust, Wakkerstroom, Ermelo, Amersfoort, etc.	d.		d.
12 months' sorted clips, light and clean	7½	to	8½
12 months' average clips, light and clean	6½	„	7½
6 to 9 months' average clips, light and clean	5½	to	6½
Short to medium lambs	5½	„	6½
Medium to long lambs	6½	„	7½

Standerton, Bethal, Middelburg, etc.

	d.		d.
12 months' sorted clips, light and clean	7	to	7¾
12 months' average clips, light and clean	6½	,,	7
6 to 9 months' average clips, light and clean	5	,,	6¼
Short to medium lambs	5¼	,,	6¼
Medium to long lambs	6¼	,,	6¾

Heidelberg, Pretoria, Potchefstroom, Klerksdorp, Lichtenburg, etc.

	d.		d.
12 months' sorted clips, light and clean	7	to	7½
12 months' average clips, light and clean	6	,,	6¾
6 to 9 months' average clips, light and clean	5	,,	6
Short to medium lambs	5	,,	6
Medium to long lambs	6	,,	6½

ORANGE FREE STATE.

Harrismith, Vrede, Bethlehem, Heilbron, etc.

	d.		d.
12 months' sorted clips, light and clean	7½	to	8½
12 months' average clips, light and clean	6½	,,	7¼
6 to 9 months' average clips, light and clean	5½	,,	6½
Short to medium lambs	5½	,,	6½
Medium to long lambs	6½	,,	7¼

Lindley, Kroonstad, Vredefort, Parys, etc.

	d.		d.
12 months' sorted clips, light and clean	7	to	8
12 months' average clips, light and clean	6¼	,,	6¾
6 to 9 months' average clips, light and clean	5	to	6

	d.		d.
Short to medium lambs	5½	,,	6
Medium to long lambs	6	,,	7

Senekal, Ficksburg, Ladybrand, Winburg, etc.

	d.		d.
12 months' sorted clips, light and clean	7	to	7½
12 months' average clips, light and clean	6	,,	6¾
6 to 9 months' average clips, light and clean	5	,,	6
Short to medium lambs	5	,,	6
Medium to long lambs	6	,,	6¾

Coarse and Coloured.

Free from kemps	4	to	5
Ordinary	3	,,	4
Inferior, kempy, and Persian	1	,,	2

BASUTOLAND AND NATIVE WOOLS.

	d.		d.
Superior lots, light and clean	5½	to	6½
Average lots, light and clean	5	,,	5½
Average lots, heavy and wasty	4½	to	5

MOHAIR.

	d.		d.
Kids, good length and super quality	13	to	16
Long blue, super quality	11	,,	12½
,, average	10	,,	11
Ordinary lots	8	to	9
Short and mixed winter	7	,,	8
Inferior and coloured	4	,,	6

BASUTOLAND AND NATIVE MOHAIR.

	d.		d.
Average lots, mixed quality	9	to	10
Average lots, inferior	6	to	8

HIDES, SKINS, HORNS, AND BARK.

Hides.—Sundried, 14 to 20 lb. average, 8d. to 8¾d. per lb.; sundried, inferior, 5d. to 7d.; salted, 6½d. to 7½d.

Sheepskins.—Long-wooled, 4½d. to 4¾d. per lb.; short-woolled, 3d. to 4d.; pelts, 1d. to 2½d.; coarse and coloured, 2d. to 3½d.; salted, heavy, 3½d. to 4d.

Goatskins.—Mixed parcels, sound, 3d. to 4d. per lb.; inferior, 1d. to 2½d.

Horns.—3d. to 10d. per pair.

Wattle Bark.—Cut and bagged, good colour and quality, 5s. 6d. to 6s. per cwt.; cut and bagged, inferior colour and quality, 4s. 6d. to 5s.; uncut in bundles, good colour and quality, 4s. to 5s.; uncut in bundles, inferior colour and quality, 2s. to 4s.

Current Market Rates of Agricultural Produce and Stock.

The following TABLE OF CURRENT MARKET RATES OF AGRICULTURAL PRODUCE AND LIVE STOCK on Saturday, 2nd March, 1912, ruling at the several Centres named, is published for general information.

Centre.	A. Wheat per 100 lb.	B. Wheat Flour per 100 lb.	C. Boer Meal per 100 lb	D. Mealies per 100 lb.	E. Mealie Meal per 100 lb	F Barley per 100 lb.	G. Oats per 100 lb.	H. Oat Hay per 100 lb.	J. Lucerne Hay per 100 lb.	K. Potatoes per 100 lb.	L. Tobacco (Boer Roll) per lb.	M. Beef per lb.	N. Mutton per lb.	O. Fresh Butter per lb.	P. Eggs per dozen.	Q. Cattle (Slaughter).	R. Sheep (Slaughter).	S. Pigs.
Cape Province:	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.	s. d.	£ s. d.
Aliwal North ...	8 6	21 6	12 6	5 6	7 6	8 0	8 0	4 0	3 9	5 0	1 0	0 7	0 6	1 6	1 0	12 0 0	15 0	3 0 0
Beaufort West ...	7 6	16 0	10 3	7 6	9 0	8 6	7 0	4 6	4 0	9 0	1 0	0 4½	0 3½	1 3	1 6	12 0 0	12 0	2 10 0
Capetown ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
East London ...	9 6	18 0	29 0	8 0	13 0	6 6	6 0	4 6	5 0	14 0	1 0	0 5	0 6	1 3	1 9	15 0 0	20 0	1 10 0
Grahamstown ...	7 9	—	—	5 9	—	4 6	7 3	3 3	—	12 6	0 8¼	0 5	0 5	1 4½	1 9	—	15 0	3 0 0
Kimberley ...	8 3	12 9	11 6	6 0	7 0	8 0	7 0	4 9	4 6	12 0	0 5	—	0 4½	1 3	1 9	11 0 0	14 0	3½d. p. lb.
Kingwilliamstown	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Port Elizabeth ...	9 0	—	—	7 6	—	4 6	7 0	3 0	3 6	12 6	0 4	0 8	0 7	1 6	2 0	—	—	2 0 0
Queenstown ...	6 9	—	—	—	8 6	—	5 9	3 0	—	10 6	—	—	—	—	1 3	—	—	*
Natal:																		
Durban ...	—	—	—	6 7	—	—	—	—	—	6 8	—	—	—	1 1	2 1	—	—	—
Pietermaritzburg	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Transvaal:																		
Pretoria ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Johannesburg ...	6 11	—	10 6	5 3	5 1	7 6	6 2	5 0	4 6	10 0	0 2	—	—	1 3	1 10	—	—	—
Orange Free State:																		
Bloemfontein ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Harrismith ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

* No quotation. Remainder of items unchanged.

NOTE.—No returns have been received from those centres shown blank.

Departmental Notices.

GOVERNMENT GUANO.

It is hereby notified for the information of farmers requiring Government guano that, owing to the enormous increase in the demand for this manure this year and the shortfall in the crops collected from the islands during the last three seasons, all the reserve stock of guano has been disposed of, and, as the bulk of the new season's collections is not expected to reach Capetown before the middle of May next, the execution and delivery of orders received during the months of March and April will be delayed.

Applications for guano received after the date of this notice will be booked *provisionally*, and applicants will be advised from time to time, as cargoes arrive, of the probable date upon which their orders can be executed.

For the present, applications for guano should *not* be accompanied by remittances.

The ordering of guano through the medium of station masters is suspended until urther notice.

F. B. Smith,
Acting Secretary for Agriculture.

The Agricultural Journal

OF THE UNION OF SOUTH AFRICA.

Vol. III. APRIL, 1912. No. 4.

Issued MONTHLY in English and Dutch by the Department of Agriculture.
Communications to be addressed to the Editor, Department of Agriculture, Box 434, Pretoria.
Telegraphic Address: "Bulletin, Pretoria."
Subscriptions should be posted to the Government Printer, Box 373, Pretoria.
Advertising inquiries should be addressed to the Metropolitan Advertising Co., Box 962, Capetown.

Facts and Theories about Stijfziekte and Lamziekte.

By Dr. A. THEILER, C.M.G., Acting Director of Veterinary Research.

THE following paper is intended as a preliminary communication, and comprises notes and observations on the above-mentioned diseases. The information was obtained from various sources; the earlier numbers of the *Agricultural Journal of the Cape of Good Hope* and the annual report of the Veterinary Department written by the late Dr. Hutcheon and his staff were all consulted.

I also endeavoured to obtain the opinions of farmers by putting a number of questions to them in a "Lamziekte Query Sheet", and I am pleased to say that a good number of replies were obtained in this way.

The discussions that appeared in various farmers' papers dealing with the subject were also read with much interest, and in addition I personally interviewed a great number of stock-owners in various parts of the Union, visiting their homes, making personal inquiries, investigations, and comparisons. The experiments carried out by different experts, and more particularly by my assistants, will be referred to in a subsequent part of the paper.

I wish to make it clear that time has not yet allowed me to work up all the material at my disposal. It is, however, my intention to give in broad outlines a sketch of our knowledge concerning this disease, to collect facts as far as possible, to point out the theories deducted from these facts, to compare the practical experience of the farmer with the experimental knowledge of the expert, and finally to correct some erroneous conceptions about the diseases mentioned.

These different points will be dealt with under three main headings:—

PART I.—A review of the historical side of the question with particular reference to the researches and investigations of the late Dr. Hutcheon and his staff.

PART II.—A comparison with diseases in other parts of the world, in which a deficiency of phosphates is noted, or which show similar symptoms to lamziekte and stijfziekte.

PART III.—Recent observations noted in South Africa, compiled from various sources and particularly dealing with the investigations and experiments undertaken by the writer himself.

PART I.

HISTORICAL NOTES ON STIJFZIEKTE AND LAMZIEKTE.

Lamziekte is apparently not a new disease in South Africa, as in records of over a century ago reference is made to it.

Dr. G. M. Theal, the historiographer of this sub-continent, to whom I applied for information, referred me to Deel III of "Belangrijke Historische Dokumenten over Zuid-Afrika", collected in the Hague and in Berlin.

This collection of documents contains a diary of a commission appointed by the Government of the time of Commissioner Van der Mist to visit certain farmers and to induce them to improve their flocks by using woolled sheep rams, or, as they are called in the report, "Spanish Sheep".

The commission consisted of three members. They started on their travels on 25th September, 1805, from Koeberg, in the present District of Wellington, and travelled along the Vogel Valley (Paarl) to the Tulbagh District, and along the Witzenberg Mountains to the present District of Worcester. Then they went along the Hex River Valley to Touws River and along Verkeerde and Laken Valley to the Ceres District; they visited Karropoort and went across the Doorn, Dweyka, and Ongeluk Rivers into the present District of Sutherland (Aapenberg) and into Calvinia Districts; over Hantam's Berg to the Bokkenveld and Kobie Mountains; then across the Doorn River into the present District of Clanwilliam; along Oliphants and Twenty-four Rivers into Piquetberg and then to the present District of Malmesbury and back to the starting point.

On this journey, the presence of lamziekte was noted amongst the cattle of fifteen different owners; the first place mentioned was "Houd Constant". The names of the farms of the fourteen others are not given, but ten are situated in the territory of the Twenty-four Rivers.

That the disease is identical with our lamziekte can be recognized from notes by the famous naturalist, Dr. Lichtenstein, who lived in South Africa in the years 1803, 1804, 1805, and 1806. I am indebted to Dr. Gunning for these details.

Anent the disease he says as follows:—

"This place (in Goudinie District, Cape Colony) (which the commission also visited) is surrounded by mountains and rivers and cannot be reached in the winter time when the rivers are flooded. It is therefore called the "Eiland". Here we saw for the first time a cow which was suffering from lamziekte. For a week past she had been stretched out on the ground and could occasionally be brought on to her feet only with the help of men. The whole disease consists of a paralysis of the nerves, principally of the loins and the hind-quarters. The cause, however, as well as a certain cure, have not been found out. When the disease lasts for some time and the animal

continues to feed, as in this case, then one is entitled to the hope that the animal will recover."

On another page of the same book he says:—

"From many a farmer we heard the remark that lamziekte at present is not so prevalent, because there was a succession of years with much rain and the disease appears more frequently after a prolonged drought."

The next information about the existence of this disease in the Cape Colony is contained in the Settler's Guide to the Cape of Good Hope and Natal, published by Edward Stanford, 6 Charing Cross, London, 1858, Mr. Parker, the hon. secretary of the Uitenhage and Port Elizabeth Farmers' Association, was good enough to draw my attention to it. On pages 164-165 a paper by a certain Mr. Reitz is published on the various cattle diseases, in which the following statement occurs:—

"Lam-sickness; no one knows the cause or seat of and yet it is one of the oldest and most destructive cattle diseases we have."

Perhaps the most valuable notes on lam-sickness and stiff-sickness in cattle are contained in the report of the late Dr. Hutcheon, Colonial Veterinary Surgeon, and I consider it worth while to republish them as fully as possible, as they show the actual position concerning these diseases during the last years of the past century and in the beginning of the new one.

In December, 1882, Hutcheon visited the neighbourhood of the farm Highlands, Lower Albany, and examined some cattle that were affected with a disease known as stiff-sickness. He could, however, not see any suitable cases, although he obtained the information that the disease prevails mostly in dry seasons. His conclusions were that it usually commenced in the winter, and on pastures that had lately been burned and were green, sick animals would improve.

In the course of his notes he says it is a well-known fact that cattle in that district have a great craving for chewing bones. He makes the statement:—"Why the disease should be on the increase of late years, unless it has been due to the dry season, I cannot offer an opinion."

According to this the disease must have been known in this part of the country for some time.

Much valuable information is obtained from his report for the year 1884.

In March, 1884, Hutcheon arrived in Barkly West in order to investigate lamziekte. He found it there on the farms Newlands, Donderboschfontein, and Wolverfontein. He subsequently spent some time in the neighbourhood of Cathcart West, visiting several farms. Here he met with the disease anthrax. Driving round a wide circle of farms, he only met with stijfziekte, but saw no cases of lamziekte.

In April he drove along that elevated plateau called the Kaap Range, calling at all the farms on his route where he heard of any sickness or where the disease had been very prevalent. He saw numbers of stijfziekte cases in various stages, but no lamziekte until he arrived at Daniel's Kuil. In the neighbourhood of this place he saw a few cases of lamziekte. All were in various stages of recovery. He also saw there a number of cases of stijfziekte. Leaving Daniel's Kuil he travelled towards Griquatown, going round by that large

shallow valley or vlei called White Pan, calling on several farms. There were no cases at that time, but previously cattle had been lost from the disease and the herd had been sent away. In the neighbourhood of Griquatown, at a place called Comma, he found a cow suffering from the typical form of the disease. He then made a post-mortem examination. Leaving Griquatown he drove towards Douglas, calling at Spuitang, the owner of which informed him that he had lost two hundred cattle from lamziekte. On asking whether he considered the disease infectious or contagious, or whether he had observed any bad effects to follow when sheep or goats ate the contents of the stomach of a beast which had died of lamziekte, the owner replied in the negative, and took him to the place where the majority of the carcasses had lain to show the doctor that every vestige of the carcasses had been eaten by the remaining cattle—the contents of the stomachs being consumed principally by sheep and goats, and he had never observed any ill-effects to follow.

At Douglas Dr. Hutcheon was informed by a Mr. Wright that an old Griqua, whose age was estimated at nearly one hundred years, had said that lamziekte had prevailed as an epizootic over the whole territory of Griqualand West three times during his lifetime, each time carrying off nearly the whole of their cattle, and each visitation of the disease was during an exceptional drought.

In the District of Herbert there appeared to be but little of the disease—only upon exceptional farms.

From Douglas, Hutcheon travelled via Campbell, Schmidt's Drift, and returned by the Kaap Range, calling at various farms. On one of these he found a young ox suffering from stijfziekte.

The observations made on this journey *re* lamziekte and stijfziekte are then summarized.

Those referring to stijfziekte I have already quoted in my paper on stijfziekte in the first number of the *Union Agricultural Journal*, but in order to make this historical review as complete as possible I repeat them here:—

"Individual cases of the disease may appear at any time of the year, especially during a period of drought like that which was experienced in the territory of Griqualand West during the years 1882-83, but in ordinary seasons it is most prevalent during the early spring months after the grasses have shed their seeds and become withered and before fresh grasses have sprung up. It generally disappears after good rains. Animals of all ages and of either sex are subject to the disease, but young growing stock and cows—either in calf or giving milk—are by far the most liable to become affected. Full grown oxen are seldom affected and oxen in work are still more rarely attacked. Young heifers are said to be more frequently attacked than bullocks of the same age, and cows immediately before and immediately after calving are more subject to the disease than the same animals at any other period.

"In ordinary seasons the mortality from stijfziekte is not very great. In cases which terminate fatally, the animals that die do not succumb to the direct effects of the disease so much as to the poverty which is induced by the pain which the affected animals suffer in walking; this prevents them from travelling far in search of food. The majority, therefore, die of debility and starvation."

It was found that in the western Cape the disease was associated with a peculiar condition of the soil, and with regard to this character Hutcheon says:—

"The disease manifests itself on different kinds of soil, but within the territory of Griqualand West it is most prevalent along that elevated plateau called the Kaap Range. On that tract of country the soil is principally calcareous—a sort of magnesian limestone, intermixed in some places with a red sandy loam. On many parts along the valleys of the Vaal and Harts Rivers, where the soil is more of a clay loam, the disease is rarely seen, and when animals which are affected with the disease are removed to such localities all symptoms of the disease disappear very rapidly. But on whatever character of soil the disease manifests itself, whether calcareous, silicious, or red sandy loam, there are clear indications that the vegetation which grows upon such soil during the prevalence of the disorder is deficient in one most essential ingredient of a complete food, viz., phosphates.

"This leads us to consider the nature of the disease. Stijfziekte is what is termed an enzootic disease, that is a form of disease which is confined to certain localities and is due to some special conditions which are peculiar to the soil—food or water of such localities. In this disease the enzootic influence is, in my opinion, a peculiarity of the soil which in dry seasons becomes incapable of supplying all the ingredients in their proper proportion which constitute a complete plant-food. The soil may, and does, contain all the necessary constituents of plant food, but they exist in an unavailable form. There is often a great quantity of fertilizing matter in the soil, but not in a condition immediately available for the growth of plants. Thus phosphates exist often potentially in a dormant state in the soil in great abundance, but it is not until they have been brought into a soluble form that they are of any use as food of plants. The phosphates are highly important in an agricultural point of view; unless they are present no albumen or other azotized matter can be formed. Azotized matter cannot exist without the presence of phosphates (Balfour's *Botany*).

"My experience of lamziekte and stijfziekte is far too limited as yet to enable me to give an authoritative opinion, but I have hitherto found these diseases to prevail mostly on dry porous soils such as the calcareous and silicious, which have little power of retaining moisture, and on such soils they are most prevalent during dry seasons.

"That these diseases are induced by a deficiency of phosphates in the food is indicated:—

"*First.*—By the intense craving for bones and all kinds of animal matter which the stock that are grazed on such pastures manifest. As already stated, on many farms along the Kaap Range cattle were reported to have eaten the complete carcasses of lambs, whilst at Spuitang not a vestige was left of the carcasses of about two hundred cattle. It is noticeable also that this craving for animal matter increases as the disease becomes more prevalent, and almost ceases when the disease disappears.

"*Second.*—By the nature of the disease, stijfziekte being a congested and inflamed condition of the bones and articular cartilages of the fore legs, due, in my opinion, to the want of sufficient phosphate of lime in their composition. In healthy bone this salt should form about 57 per cent. of its whole substance. It has also been shown

by experiments conducted by Chossat, Roloff, and others that when animals are fed upon a diet deficient in phosphate of lime the bones lose more or less of their hardness and firmness and exhibit the lesions of osteomalacia and rachitis. Conversely, Roloff found that by administering phosphate of lime to a young rachitic dog it thoroughly recovered in three months. During my journey through the territory of Griqualand West I saw several cases of typical rachitis in young animals. Two very aggravated cases were shown to me at Daniel's Kuil—one of a young bullock belonging to Mr. Beadle, the other a young animal belonging to Mr. Ayton, Rotterdam. The fore legs of these animals were bent to such an extent that they could walk only with difficulty. In the one belonging to Mr. Ayton the knees overlapped one another to a considerable extent, yet the legs of both animals were perfectly normal at birth. It is worthy of remark that calves while suckling do not become affected with the disease.

"*Third.*—By the fact that young growing animals and cows which are either nourishing a full-grown *foetus in utero*, or secreting a full supply of milk immediately after calving, are the animals most liable to become affected with the disease. A good illustration of this fact was brought to my notice at Daniel's Kuil. On the farm belonging to Messrs. Wilmore, adjoining Daniel's Kuil, I was informed that one hundred full-grown oxen had been grazing there for eleven months, that they had not been inspanned nor once off the farm during the whole of that time, and that not one of them had become affected with either stijfziekte or lamziekte, whilst during the same period the Messrs. Wilmore lost seventy fine head of breeding stock, cows, and young growing cattle from this disease. I heard of numbers of exceptions to this rule, but this did not alter the generally acknowledged fact that young growing animals which require a greater proportion of phosphates in their food for 'cell formation' and nourishment for growing tissue, especially bones, and cows—the blood of which is being drained either to nourish the developing *foetus in utero* or to supply that nourishing fluid, milk, which form the food of the growing tissues of the calf after birth—are the animals most liable to become affected with these diseases.

"*Fourth.*—By one of the successful measures which are adopted for the cure of stijfziekte, viz., active exercise. When an animal, either a bullock or a cow, becomes affected with the disease, if you inspan the animal at once, either to a wagon or a plough, the symptoms of the disease invariably become very much ameliorated. How is this? During active exercise there is increased tissue change produced in the organs employed, and one of the substances formed during this process of the disintegration of tissue is phosphoric acid, which would be acted upon by the carbonate of lime which is present in these districts in great abundance, and thus form the phosphate of lime required. This is making the animal manufacture phosphates for its own consumption. The active exercise would of itself produce healthy nourishment in the affected bones by increasing the circulation of the blood within their textures and relieving the tendency to congestion which always exists in these diseases.

"*Fifth.*—By the fact that the disease is most prevalent when the vegetation contains the least nourishment, such as a period of drought like what was experienced during 1882-83 and 1884, and in ordinary seasons during the winter and spring months after the grasses have

ripened and shed their seeds and thus parted with a great proportion of their nitrogenous and flesh-forming substances. When the grass grows up luxuriantly after good rains, such as they were favoured with in the territory of Griqualand West during the first months in 1884, the disease suddenly disappears. As already stated, I had to travel over the whole territory before I could find a sufficient number of typical cases to enable me to form an opinion upon the nature of the disease. Further, the disease manifested itself during the recent drought on farms upon which it had not been observed before, and, as already mentioned, according to the old Griqua's statement it had carried off almost the whole of the cattle in the Griqualand West territory three times within the last hundred years, and each of these calamities occurred during a period of exceptional drought.

"*Sixth.*—By the fact that where stock were supplied with mealie stalks, chaff, etc., mixed with common salt, the disease did not manifest itself amongst them. Mr. Leischam, on the Kaap Range, supplied me with information confirmatory of this fact.

"The above facts appear to me to indicate that the diseased condition, termed 'stijfziekte', is due to defective nutrition of the bones of the affected animal, and that this arises from the absence of a sufficiency of phosphates in the vegetation upon which the animal feeds. It may or may not be chemically deficient in the soil, but it is not available for plant food.

"*Symptoms of Stijfziekte.*—As the fore legs have to support the principal portion of the weight of the animal's body, they are the structures which are principally affected in this disease. The animal walks with back arched, hind legs brought well forward under the body; this is to relieve the fore legs from as much of the weight of the body as possible. There is no stiffness in the movement of the fore legs; the feeling of pain is evinced when the weight of the body comes upon the affected limb.

"To avoid this as much as possible the animal throws the weight as much as practicable on the heels of the fore feet to prevent jarring the bony column, while at the same time you will observe the shoulder-blades project up above the withers; this is done by a muscular effort in order to relieve the painful limb of the weight of the body. Although the back is arched there is no disease or affection of the spine as some have supposed. It is merely a symptom and is produced, as already stated, by the effort which the animal makes to get the hind legs under the body to relieve the fore legs of their ordinary share of the weight.

"In all severe cases which have been ill for some time the hoofs grow out very long, especially the hoofs which cover the external digits. Elevated circular rings will be observed surrounding the parts of affected limbs from the coronets downwards, and in some cases there is an enlargement similar to what is termed a ring-bone in a horse, immediately above the coronet. The animal lies a great deal, and can scarcely be induced to walk in search of food; as a result it becomes very poor, eyes sunken, and has a generally starved appearance.

"*Post-mortem Appearances.*—As already stated, by the kindness of Mr. Leischam, who killed a young bullock which was suffering from an acute form of stijfziekte, I was enabled to make a careful examination of the carcase. I found the whole of the internal organs

with their contents and secretions perfectly healthy to appearance, and the flesh normal in colour and feel. There were no indications of disease anywhere except in the bones of the fore legs, especially those from the knee to the foot. The articular extremities of these bones with the cartilage covering them were congested; this congestion visibly increased as you descended to the foot or pedal-bone, which was very much congested. This animal had been only a few days affected, so that there was no time for any effusion to have taken place or ulceration of the articular cartilage which I would expect to find in cases of long standing."

About lam-sickness the following notes are to the point:—

"In this diseased condition (lamziekte or paralysis) the animal appears to lose the power of its hindquarters, lies down, and, as a rule, seldom gets up again. While lying the animal manifests no particular pain, the pulse, breathing, and temperature appear very little disturbed; it will eat and drink up to within a short time of its death if food and water are brought to it. There must be exceptions to this rule because several correspondents have stated that the appetite fails. The average time that an animal lives after it has lain down is from four to eight days. Some few cases will die sooner and some will last very much longer, depending upon various circumstances, such as weather, etc. Animals were reported as having died of lamziekte within a few hours after they had been observed to be sick. I am convinced, however, that these cases of sudden death are not from the disease called 'lamziekte' at all, but from a much more virulent and dangerous disease, viz., 'giftziekte' or 'meltziekte'.

"My opportunities of investigating into the real nature of lamziekte were unfortunately very limited, but from the cases which I did examine I am of opinion that the disease is simply a modification of stijfziekte.

"Both diseases prevail upon the same farms at the same time, and are aggravated or ameliorated by the same modifying conditions which, I have already stated, exercise an influence on the developments or cessation of stijfziekte. The only difference appears to be that in stijfziekte the disease or defect is localized principally in the bones of the fore legs, while in lamziekte the disease or functional defect is more general, affecting the muscular as well as the osseous tissue.

"Lamziekte is, in my opinion, a more intense form of the disease than stijfziekte. You will see a number of cases of stijfziekte where there may be but individual cases of lamziekte, but when the latter disease becomes prevalent the former disease is generally very prevalent. On certain farms a number of cases of stijfziekte will occur every year, but it is only during exceptionally dry seasons that lamziekte becomes prevalent."

Dr. Hutcheon gives the symptoms of one case of lamziekte as follows:—

"The affected animal was a brown cow, five years of age, giving milk. . . . She was lying in a natural position on her left side; she had been lying there for three days; there was evidence, however, that during that time she had dragged herself about, for she had moved consecutively round a circle five yards in diameter. Whether she had been struggling to get up or only making an effort to reach some food it is difficult to determine, but it was most probably

the latter, as she was chewing a mouthful of dry grass when we arrived. Her general appearance gave no indication of pain or even serious uneasiness, her pulse, breathing, and temperature were normal, her eyes were deeply sunk into their sockets. During the time that she had been lying she had discharged three separate quantities of faeces; these were very dry, hard, and in small pellets resembling the faeces of horses.

A post-mortem was then made and the following lesions noted: Impaction of the rectum, congested condition of small intestines, and the dry and caked condition of the outer leaf of the 'blaar pens'. The spinal cord throughout its whole length was examined, but except that there was a congested appearance about that portion situated between the loins and the tail (sacral) region, it looked perfectly healthy.

Dr. Hutcheon continues:—

"There is a very strong opinion amongst the farmers generally that lamziekte is caused by some poisonous herb or herbs which the cattle pick up in the veld, and in support of this opinion they will tell you that if they allow their cattle to feed on a certain portion of their veld some of the cattle will manifest the symptoms of the disease directly. Against this opinion, however, there is very strong evidence:—

"(*a*) There are no symptoms of sickness or fever about the animal when first observed. The first indication of the animal being affected is a certain peculiarity in its movements, and as already stated, the majority of those affected will continue to feed to within a short time of their death if food is brought to them.

"(*b*) If lamziekte was caused by the animals eating some poisonous plant or plants, how can we account for the fact that full-grown oxen, and especially working oxen, so rarely become affected, as on Messrs. Wilmore's farm?

"(*c*) Although cattle that are grazing on a farm where the disease prevails will develop the symptoms of the disease very rapidly after being allowed to graze on a particular portion of the veld, healthy cattle brought fresh from another farm where the disease does not prevail, will not develop the symptoms of the disease so rapidly, although allowed to graze on such veld. . . . There is another opinion respecting the nature of this disease upon which many farmers are very confident, viz., that it is contagious; that any healthy animal which eats the contents of the stomach of a beast which has died of lamziekte becomes affected with the disease and invariably dies within twenty-four hours.

"There are an equal number of farmers who are just as confident that the real lamziekte is not a contagious disease and bring equally strong evidence in support of their opinion."

Dr. Hutcheon then points out that anthrax is responsible for this discrepancy of opinion.

In June, 1884, Dr. Hutcheon wrote to the Civil Commissioners of Bathurst, Alexandria, and Uitenhage, inquiring whether the diseases termed lamziekte and stijfziekte affected cattle in their divisions, and if so, if they would kindly favour him with any information respecting the conditions and circumstances under which those diseases generally appeared.

The Civil Commissioner of Bathurst replied to the effect that the

diseases known as lamziekte and stijfziekte did occur in that district, but are regarded in that locality as being merely symptoms of famine or low condition caused by drought and intensified by bad and stagnant water.

The answer from Uitenhage was to the effect that stijfziekte is more prevalent in the extremely "zuurveld", such as Tzekama, etc. A farmer in Afdak wrote to the effect that stijfziekte prevails in zuurveld and is not the least infective. He continues: "It comes on towards the winter months when the veld is dry. If the veld is short, green, and fine, cattle are not liable to it except delicate milk cows and young cattle. I had four of my oxen sick of stijfziekte in 1883. I could not work them; they could hardly move. I fed them two weeks on green barley when they became as well as ever. That is proof enough that it all depends on the pasturage.

"Lamziekte prevails more in sweet and bush veld; the cause of it is constant and long drought, bad pasturage, and bad water. If the veld is good and fine they are not liable to it. It is not a pest like 'lungziekte', 'redwater', 'rinderpest', etc.—in fact it all depends upon the weather."

In June, 1884, Dr. Hutcheon visited Mr. Hudson's farm near Coega (Alexandria District) where he had been informed that the previous season a great many cattle had died from lamziekte and stijfziekte. His principal object was to ascertain whether the nature of the soil and character of the veld corresponded with the soil and veld of Griqualand West, and whether the conditions generally were similar to those existing in the Griqualand territory.

On inquiry and examination he found that the general conditions associated with the appearance of lamziekte and stijfziekte in that district were almost identical with the general conditions existing on the Kaap Range.

On that elevated ridge, called the "Grass Ridge", where the disease was reported to be most prevalent, the soil is of a calcareous formation, light and porous, and very liable to be affected by a prolonged drought such as was experienced during the months when these diseases were most prevalent. The affected cattle manifested the same symptoms, the same craving for bones and animal matter of every description. The same class of cattle, viz., milch cows and young growing stock, were the animals most liable to become affected. In every particular the existing conditions tended to confirm the opinion which he had formed of the cause of these diseases during his visit to Griqualand West.

Further information about lamziekte is contained in the report of 1885. He then visited Alicedale, in the neighbourhood of which certain farms were affected. On 3rd July of the same year he investigated it in the neighbourhood of Coega.

In January, 1886, he revisited Coega, as lamziekte was reported to have made its appearance again at Hangham Park.

In the same report he states:—

"There is a form of gall-sickness associated with paralysis which occurs with great frequency in certain districts of the Colony where the disease termed lamziekte prevails and is generally confounded with it. This is not to be wondered at, considering that they both prevail at the same time, manifest similar symptoms, and are mainly due to the same cause. They may, however, be distinguished from

one another by the fact that in lamziekte or adynamia there are no symptoms of pain or constitutional disturbance; the pulse, breathing, and temperature appear normal; the animal will eat and drink up to within a short period of its death if food and water are supplied to it.

"Further, if the animal is lying in a comfortable situation, and turned over daily, it may live for three weeks or more. Whereas, in the form of gall-sickness, which prevails concurrently with lamziekte, the appetite fails, the animal refuses food, and manifests by its dull, depressed appearance considerable fever and constitutional disturbance."

The same report contains the following statements:—

"The animals most subject to these diseases are cows in calf or giving a full supply of milk, and young growing cattle of both sexes. Full-grown oxen seldom become affected, and working oxen, I believe, do not manifest the disease at all. . . . There may be certain herbs, or certain other conditions of the vegetation in those parts which hasten the development of this form of paralysis, but the predisposing and primary cause is undoubtedly due to the absence of sufficient phosphates in the food. When phosphates are artificially supplied by any means cattle may then graze over such veld with perfect immunity from this disease. . . . Several farmers have written to me to the effect that after supplying their milch cows with bran, they ceased to lose any of them from lamziekte, while previous to adopting the plan they lost some every year."

He then continues as follows:—

"Most observers have recognized a severe and a simple form of this complaint, although they have not been careful to mark the distinction. It is easily discerned, however. In the biliary variety the attack is sudden, the symptoms are acute, and the course of the disease rapid. As already stated, the animal is sick, refuses food, manifests pain and general constitutional disturbance, and dies in two or three days in great pain.

"In the simple variety of lamziekte, on the other hand, the primary disease is the paralysis, the disturbance of the digestive organs is very trifling."

In the report of the year 1886, referring to stijfziekte, Hutcheon states:—

"This form of stijfziekte is generally associated with that other disease, due to the same cause, termed 'lamziekte'. They occur principally in districts in which the soil is light, sandy, or on porous limestone formations, such as over a great part of Bechuanaland, Griqualand West, and many districts along the coast divisions, both east and west."

In the report for the year 1894, he states:—

"*Stijfziekte, Lamziekte, and Paralysis.*—This is a class of diseases which appears on a large number of farms throughout the Colony, but it is most prevalent in the districts on the east and west coasts, and in some of the northern districts, such as Griqualand West.

"The area over which these diseases occur is yearly extending, and on some farms the losses are so heavy that cattle farming can no longer be carried on upon such farms without frequent change of pasture."

He further says:—

"Although these diseases differ considerably in their symptoms and superficial characters. I am of opinion that they are closely related to one another in their origin, and that their principal predisposing cause is a deficiency of phosphates or bone-forming material in the vegetation where these diseases occur.

"There can be very little doubt, however, that in the case of the acute form of lamziekte there must be some other immediate and exciting agent which causes the sudden development of this form of the complaint, and which induces the nervous prostration and effusion into the cranial cavity of the medulla oblongata which so quickly follows."

On the 18th October, 1895, the first experiments were carried out in connection with lamziekte, which experiments should prove or disprove that the supply of bonemeal is a preventive for the disease.

The experiment was carried out under the supervision of Mr. Borthwick on a farm Witte Clay Berg, which was renowned for lamziekte. The farmers who were interested nominated a committee to assist, and a number of cattle were supplied for the purpose. There were thirty-seven head received and valued; these were divided into two lots of twenty-three and fourteen respectively. The twenty-three were placed in a kraal and received an allowance of three ounces of bonemeal daily, while the fourteen were kept in another kraal and received nothing. Both lots grazed together by day, and were in every respect treated alike. The reason why the cattle were not more evenly divided was because this farm had such a bad reputation for lamziekte that they were led to anticipate that a great many of the lot not receiving bonemeal would take the disease, and as it was not intended to make the experiment more costly than was absolutely necessary, only a small proportion was risked. Within a month no mortality took place, and then some more and younger cattle were added to the lot, viz., thirteen heifers, one young cow, and three young oxen. Of these, seven had to receive bonemeal and nine not. The experiment was concluded in February, 1896, and the results were as follows:—None of the animals which received bonemeal manifested the slightest indication either of stijfziekte or lamziekte, while out of twenty-three which did not get any, ten became affected, four of which terminated fatally, and two of which were killed for experimental purposes.

The experiment was considered to be a complete success, and to have clearly established the fact that a liberal allowance of bonemeal given to cattle where lamziekte prevails acts as an effective preventive of the most common form of that disease.

Mr. Borthwick at that time also undertook some feeding experiments with a leguminous plant with negative results; he further inoculated blood of a sick beast to a healthy beast with negative results, and dosed an animal with fluid contents of an affected animal with the same result.

In the report for the year 1898 I find the following interesting notes by Mr. J. A. Robinson, then Government Veterinary Surgeon:

"*Lamziekte or Stijfziekte.*—The disease known by these names appears in several forms in the south-western districts, the most common being a general unthrifty condition of the animal, malnutrition, and increasing stiffness of the articulations. It is most prevalent in the sour veld portions of the Mossel Bay, George, and Knysna

divisions. This form of the disease is quite distinct from that seen in the Southern Karroo, which is manifested by a ricketty condition of the system in young animals, and an inordinate craving for lime, salt, and bones in adults, and on post-mortem examination a generally softened condition of the osseous skeleton. This form is again different from the acute lamziekte which I have seen affecting both cattle and goats in Griqualand West, and which is probably a disease of a specific character. The rachitic form of the disease sometimes prevails very extensively, but it has not done so during the past year, and the first-mentioned type of the ailment is the one to which my attention has been chiefly directed. The chief symptoms of this form, in addition to those already noted, are gradual loss of appetite, irregular action of the bowels, and an increasing disinclination to rise, the animal usually remaining recumbent for a few days before death. The temperature is sub-normal throughout the disease.

"Post-mortem examination reveals a wasted state of the muscles and tissues, the liver is nearly always small, softened, and light in colour, and the kidneys are often congested. I have not been able to test the character of the urine. Some of the joints always show signs of chronic inflammation, and there is frequently adhesion of some of the bones of the spinal column. In one case which I examined, five of the lumbar vertebrae were inseparable, and it is usual to find fusion of two or three of the posterior dorsal bones. As most of the animals examined were trek oxen, this may in some degree be due to the rough usage they had met with during their unenviable existence. The bones are not at all softened, and I have never noticed any increase in the meningeal fluids. I am of opinion that this disease is a chronic rheumatism due to the extremely acid material on which the cattle in these districts subsist. If the animal in the early stages can be removed to sweet veld or salt vlei, the symptoms soon become modified."

The last notes by Dr. Hutcheon on stijfziekte and lamziekte in cattle are contained in the September number of the *Agricultural Journal of the Cape of Good Hope*, 1903; they are in reply to a controversy, and may be considered to represent Dr. Hutcheon's latest view. The description of both stijfziekte and lamziekte is given, to which I will in a future part of my paper have to refer to again.

"STIJFZIEKTE.

"It is a highly congested, sometimes even inflamed, condition of the ends of the long bones which form the joints of the limbs, principally of the fore legs, because they have the greatest portion of the weight of the body to bear.

"This congested condition of the ends of the bones is accompaneid by acute pain and lameness.

"The animal walks with its back arched, and its fore legs extended so that the heels come to the ground first, while the hind legs are brought well forward under the body, to take as much of the weight of the body as possible and thus relieve the inflamed and tender joints of the fore legs.

"In some cases of long standing there is enlargement of the joints, especially the fetlock and pastern, and the outer digit of the hoof is invariably larger than the inner one. In other cases there is an

enlargement round above the coronet, similar to what is termed ring-bone in the horse. The pain in walking is often very acute, the beast puts the heel of the fore foot down carefully, and when the weight of the body comes on the limbs the shoulder blade will be observed suddenly to rise up above the withers. This is done by a muscular effort to lift up, as it were, the weight of the quarter from resting on the tender bones of the limb as much as possible.

"In an acute case, if the bones of the fore legs are sawn longitudinally down the centre, the cancellous or lattice-like tissue which forms the joint ends of the long bones will be observed to be of a dark red colour, and highly congested with blood-coloured exudation. The bone marrow may also present the same appearances. There is, therefore, no doubt that stijfziekte is due to a soft and vascular condition of the bones of the limbs, and that this condition is due to a deficiency of bone earth in their substance."

"LAMZIEKTE.

"Lamziekte is a form of paralysis due to an effusion of a clear serous fluid into the membranes covering the brain and spinal cord, associated with a highly congested condition of the bones of the vertebrae, and of the articular extremities or joint ends of the long bones of the limbs, principally of the larger ones, with softening of their cancellated tissue.

"In lamziekte it will be observed that some cases are very acute and rapid in their course, the patient becoming comatose within from ten to twenty hours, and death in some instances occurring within twenty-four hours. In other cases the patients may last for days, and even weeks, during which they may eat, drink, and ruminate, and die merely from exposure or exhaustion.

"There is no essential difference, however, between the acute and the more protracted cases.

"In the acute cases the effusion of the fluid takes place into the membranes surrounding the brain, and the upper portion of the spinal cord—the medulla oblongata—which is rapidly followed by complete paralysis, coma, and death. The quantity of the fluid surrounding the medulla is sometimes so great that when the membrane is pierced the serous fluid rises up like a spring. In the protracted cases the fluid is found principally in the membranes surrounding the spinal cord in the dorsal and lumbar regions, producing paralysis of the hind extremities only, and rarely producing any disturbance of the brain.

"With respect to the cause of this serous effusion into the membranes surrounding the brain and spinal cord, I think there can be little doubt that it is intimately connected with the softened and highly congested condition of the bones of the vertebrae, which is invariably present.

"The long bones of the limbs are affected in the same manner as in stijfziekte, the only difference being that in stijfziekte it is the lower bones of the limb which are most severely affected, whereas in lamziekte it is the higher and larger bones, such as the humerus and radius of the fore leg and the femur and tibia of the hind leg which are most severely affected.

"So much for the nature of the disease." Dr. Hutcheon continues:—

"From what I have written it will be evident that I regard lamziekte and stijfziekte as simply different phases of the same disease,

arising from the same primary cause, a deficiency of phosphates in the vegetation of the particular farm or district. It may be difficult to explain satisfactorily why in certain animals and in certain localities the lower bones of the fore limbs should be the principal bones of the skeleton affected, while, in other instances, the bones of the vertebrae and the upper and larger bones of the limbs are most seriously involved. It is very probable that although the vegetation of the different districts, where this disease prevails, agrees in this one particular, that it is more or less deficient in phosphates, the vegetation of each district may differ considerably in other respects, the one from the other. In our experience we have found that a beast which is growing and improving in condition appears to be much more liable to contract lamziekte than one which is simply maintaining the same uniform condition. The latter are more subject to stijfziekte.

"Further, the most acute and rapidly fatal cases of lamziekte are generally met with in young animals in good condition. From these and other observations I arrive at the opinion that when the food is deficient in one essential constituent, the balance of the system would be the more readily upset the more abundant the other constituents are. Acute lamziekte would therefore be most prevalent where the vegetation was luxuriant, and chronic lamziekte and stijfziekte most prevalent when the vegetation was dry and not so abundant. This may account for the fact that the disease is more prevalent on certain portions of the same farm than on others.

"It is quite possible also that there are certain plants which when eaten largely by cattle may have a tendency to act as an exciting cause in hastening the development of the disease, just as certain poisonous plants, when eaten by a perfectly healthy animal, have a tendency to cause an effusion of serous fluid into the membranes of the brain and spinal cord, producing rapid coma and sudden death. But the main cause of the prevalence of this disease is undoubtedly due to a deficiency of phosphates in the food, and it disappears when that deficiency is supplied."

SUMMARY OF CONCLUSIONS.

From the foregoing extracts the following conclusions are drawn by the writer:—

(1) Lamziekte of cattle is a disease which was known in the western part of the Cape over a hundred years ago.

(2) As long as human memory can serve it was known in Bechuanaland.

(3) Even in the olden times the prevalence of the disease was associated with dry years and dry seasons.

(4) Hutcheon describes a disease, "stijfziekte", in cattle which he found prevalent in the same areas where lamziekte existed.

(5) It was well known that where stijfziekte and lamziekte occurred cattle had a craving for chewing bones.

(6) The increasing prevalence of the disease stijfziekte in 1882 was considered to be due to the dry season.

(7) Anthrax and lamziekte occurred on certain farms together and led to mistakes in the diagnosis.

(8) Sheep and goats that eat the ingesta of cattle that succumbed to true lamziekte, or cattle which fed on the remains of lamziekte cattle, did not contract the disease as a result of this.

(9) During dry years individual cases appeared at any time of the year, but lamziekte was principally noted in the early spring and after the grasses had gone to seed.

(10) All class of stock were susceptible, but more particularly growing stock and cows in calf or giving milk.

(11) Full grown oxen were seldom affected.

(12) Young heifers seemed to be more frequently attacked than bullocks of the same age.

(13) Cows before and immediately after calving are more subject than the same animals at other times.

(14) The disease was found on different kind of soils, and all these soils showed clear indications of lack of phosphates.

(15) Animals affected by stijfziekte improved when they were inspanned in a wagon or plough.

(16) When stock were supplied with mealie stalks, chaff, bran, etc., the disease did not maintain itself amongst them.

(17) Two forms of lamziekte may be distinguished: an acute form when the animal showed alarming symptoms and a slower one with a paralysis as the dominant symptom.

(18) Farmers had a strong opinion that a poisonous herb is the cause of the disease.

(19) Cattle contracted the disease more in certain parts of a farm than on others.

(20) Healthy cattle freshly introduced from a farm where the disease did not prevail did not contract the disease as quickly.

(21) In later reports Hutcheon says that in cases of acute lamziekte some other immediate and exciting agent must be responsible.

(22) In an experiment it was shown that cattle which were supplied with bonemeal did not contract the disease.

(23) All experiments to transmit the disease by the injection of blood or drenching with contents of stomach failed.

(24) In the south-western district of the Cape, according to Robinson, a disease exists, not identical with lam and stijf ziekte, but known under the same names.

DR. HUTCHEON'S CONCLUSIONS.

The deductions Dr. Hutcheon made were to the effect that lamziekte and stijfziekte are two different forms of one and the same disease, and he considered the cause to be a want of phosphates in the food.

In his later reports, however, notwithstanding the experiment which was to the effect that bonemeal-fed animals did not contract the disease, he suspects some other immediate and exciting agent which causes the sudden development of the disease, and he even admits that certain poisonous plants may be responsible.

His last views might therefore be summarized as follows:—

Stijfziekte and lamziekte are two different forms of one and the same disease; the common factor in both, as the primary cause, is a want of phosphates in the system; this want may tend to produce stijfziekte, but when another exciting cause, possibly a plant, is present, lamziekte may occur.

The practical outcome of this view was Hutcheon's recommendation of feeding bonemeal as a preventive for both stijfziekte and lamziekte; at the present time, however, there is not a consensus of opinion amongst the farmers that this precaution is efficacious.

(To be continued.)

Home Remedies for Live Stock.

By Thomas H. Dale, M.R.C.V.S., Government Veterinary Officer, Potchefstroom.

The average farmer is often laughed at by the "superior person" or those more fortunately placed for the, what appears to them, extraordinary remedies which are often pressed into service when any of the live stock of the farm fall sick, but serious consideration of the question will force the individual to wonder what he would do in similar circumstances, the nearest store probably ten miles away and the nearest chemist nearer fifty. There is also the fact that for generations the farmer has had to fall back on his own resources, retaining with almost sacred reverence the lore bequeathed to him by his sires, and making the pantry or the cart-shed his dispensary. One can see him at his wits end what to do; how he casts his eye around until it alights on coffee or cart-grease, vinegar or sheep dip, and he remembers that his grandfather once cured an ox of gall-sickness with a mixture of these, so the different ingredients are duly measured out, mixed, well shaken, and poured down the throat of the unwilling beast, one dose usually being considered sufficient, my experience tells me that it often is, and the expectant hearts of the attendant Kaffirs are thereby gladdened, and a "meat hunger" which was fast developing is assuaged, the farmer expressing his conviction that it is a new form of gall-sickness, quite different to what his father had to deal with, and then the slight commotion thus raised subsides, dies out, and there is nothing left to tell the tale but a sun-dried hide which will some day be made into reims. Still there are many remedies of the home, which if properly used and with discretion may often be pressed into service, and it is proposed to enumerate a few of these, to give their actions and uses, and include any hints which practical experience may dictate.

Dop, Whisky, Brandy, and Cape Wines.—Now although it is unusual to find any of these displayed on the sideboard of most farm-houses, it is generally found that on emergency a little, especially of the first or last, may be unearthed, and on occasion a better stimulant cannot be found. There are many times when a horse has been overdriven, or "driven over his water" so called, he stands dejectedly in his stall with a cold sweat, quickened breathing, and possibly trembling all over, a quarter of a bottle of "dop" or similar spirit with the rest of the bottle filled up with warm water, well shaken, and given by the mouth, will often stimulate the animal to look for food within twenty minutes, when a nice hot bran mash will complete the cure, and he will be all right in the morning, a serious illness having possibly been averted. Beer or stout may be given as it is, or warmed in a saucepan with a little powdered ginger added, but spirits of any kind must be diluted with three times their bulk of water or milk, for it must be remembered that a horse hasn't got a

tin throat. The above remarks apply equally to cattle where a stimulant is required. A cow has a difficult calving, the assistance, although well meant, was probably roughly rendered, and after the birth the cow is unable to rise, a good stimulant given every four hours will often be all that is required, and within the twenty-four hours she will be milking freely and feeding well; in other words, whenever a general stimulant is required no harm will be done, and much good may accrue if any of the spirits named are given in the doses indicated.

Turpentine is probably found in every farmhouse, and is used indiscriminately for every disease and condition under the sun, consequently the results achieved are varied, and this explains why it is condemned by some and extolled by others, but if used where its special action is indicated it is most useful and can be depended on. For killing worms and other internal parasites it is one of the most useful home remedies that can be applied, and in cases of colic in horses and hoven in cattle it is a very reliable remedy, and in conjunction with other home remedies which are usually found on the farm will usually effect a cure in a very short time. One of the commonest " worries " of the farmer is worms in calves, and in these cases the administration of turpentine (mixed with raw linseed oil or milk) in doses of a tablespoonful and a teaspoonful for lambs and kids generally produces the desired effect, but not always; some cases are most intractable, but in these we can forsake our household dispensary and obtain from the chemist some extract of male shield fern, which can be administered in doses of 1 drachm with half a dose of turpentine and the usual amount of linseed oil, this mixture invariably producing the desired result. In colic in horses or hoven in cattle it is recommended that 2 ounces of turpentine and 1 pint of raw linseed oil be put into a whisky bottle, well shaken until thoroughly mixed, and then the bottle filled up with dop, whisky, or other spirit, again well shaken, and carefully bottled down the animal *by the mouth*. This usually gives relief, but if it does not within an hour, a third of a bottle of whisky, dop, or other spirit filled up with warm water may be administered, or if kept in the house, 2 ounces of chlorodyne may be given diluted in a bottle of *cold* water. Should there be no raw linseed oil in the house it will be found that turpentine mixes well with milk, and although this is not so good, as the oil has a laxative effect on the bowel which the milk has not, it is a means of administering the turpentine which will not mix with water.

Linseed Oil.—As will have been already seen under "Turpentine", linseed oil is of very great service and general use, but when using this for animals care must be taken that it is the raw oil which is used and not the "boiled" oil which is used for paints and varnishes, as this in its preparation has lost its active principle and is apt to produce the opposite effect to that expected. Linseed oil has many uses; in small doses it is very feeding. Like cod-liver oil, butter, lard, and fats of all sorts, it can be used as a vehicle for the administration of the more potent drugs, and in large doses is a very valuable purgative that can be depended on and has not the violent properties of croton oil and other drastic purges which often gripe, and unless given with some carminative or other cause colicky pains and much distress. For delicate and light fleshed animals 1 ounce

in a bran mash twice a day will often work wonders and bring them into a sleek and healthy condition which is often permanent. But it is as a purgative that it is so valuable in this country where aloes is so often unreliable. One pint usually ensures profuse purgation in horses. For cattle epsom salts are better, but if these are not available two pints of oil may be given, shaken up with the same quantity of treacle, gruel, milk, or spirits and water, but there is no doubt that epsom salts is the very best purgative for cattle, and ought to be a household remedy on every farm if already not so. Although castor oil is better for calves, sheep, and pigs, linseed oil can be given in the following doses:—Calves from 4 to 10 ounces, according to age; sheep and pigs 6 to 10 ounces; dogs may be given 1 to 2 ounces, according to size.

Castor Oil has very much the same action as raw linseed oil, but for calves, sheep, and pigs is preferable. Both foals and calves soon after birth often experience difficulty in passing anything. There is no drug which has a better effect than castor oil, and if enemas of warm soap and water are given the little animal will receive relief in a very short time. Sheep and pigs can be given 2 to 4 ounces, according to age and size.

Salad Oil and Sweet Oil.—Should there be no linseed or castor oil in the house, either of the above may be used and will be found a fair substitute.

Lard may be used as a substitute for lanoline, vaseline, etc., in making ointments such as sulphur ointment, zinc ointment, and tar ointment.

Paraffin is found in every homestead, which is probably the reason it is more used than any other remedy; and although all sorts of virtues are claimed for it its medicinal properties are not very marked, and it is very questionable whether it is of much assistance in combating the numerous diseases and conditions to which it is applied. and as it has an irritant effect on the digestive tract it should not be given to horses or cattle in larger doses than 1 ounce. Externally, however, it can be used with advantage to cure mange in horses and cattle and to kill lice, a convenient mixture being made as follows:—Rub up some soap in hot water until it is all dissolved, then stir in an equal quantity of linseed oil, and when this is well mixed add gradually an equal quantity of paraffin (that is equal quantities of paraffin, linseed oil, and soap water). Rub this well into the skin, especially into the mane and tail, on three days in succession. Leave this on for a week, and then wash off with warm water and soap. A cure is generally effected, but if not quite cured repeat the process.

Sulphur is found on most farms, and amongst other things is used for dusting vines to destroy rust and fungi and to make lime and sulphur dip for the cure of scab in sheep. But it can also be used internally with advantage in many cases and externally as an ointment. Many unthrifty animals are benefited by giving small doses of sulphur for ten days or a fortnight in their food, this especially applying to unthrifty pigs. The doses are:—Horses, ½ ounce; cattle, 1 ounce; sheep and pigs, 1 to 2 drachms; dogs, 30 to 60 grains. Should it be found to be necessary to bottle it down an animal, it will dissolve in milk or it can be given suspended in gruel; it will not dissolve in water. Rock sulphur is commonly seen in drinking water supplied to dogs, but as it is insoluble the dog does not get any of it and therefore

derives no benefit, but he will usually readily take it dissolved in milk. The flowers of sulphur are often used in mixtures for the cure of mange in horses, mixed with any bland oil, fat, or lard—either alone or with paraffin added. Mange in dogs can often be cured with simple sulphur ointment. One part of sulphur with four parts of lard, well mixed and rubbed in after the animal has been well washed with soap and water, to remove the scales and scabs.

Chlorodyne is a remedy much used in the home for many of the ills that human flesh is heir to, and it can equally well be used for the animals on the farm. In cases of colic in horses 2 ounces can be given in a bottle of water half an hour after turpentine and linseed oil have been given if relief has not been obtained, but chlorodyne does not remove the cause of the colic, it only relieves the pain; it is therefore necessary to give oil to clear out the offending material whatever it may be. Chlorodyne can always be given where great pain is evidenced, but care must be taken not to repeat the dose at too close an interval.

Epsom Salts should be to hand on every farm, it is a very valuable laxative for all stock and a long way the best for cattle. Roughly, the dose may be said to be 1 ounce for every month of the animal's age up to 1 lb., but large oxen and bulls may require up to 1½ lb. Sheep take 3 to 6 ounces, according to size. In every case all the salt must be dissolved in water, and if available it is best dissolved in warm water. If sufficient epsom salts cannot be obtained half the quantity may be given and the other half of the dose made up with common salt, which some maintain acts better than the epsom salts alone. Horses suffering from biliary fever may be given 2 ounces of epsom salts in their drinking water twice a day with advantage, the medicine reducing the fever and keeping the bowels in nice order without purging the animal.

Common Salt may be used if epsom salts are not to hand, but the dose should be slightly less; ¾ to 1 lb. being sufficient for a full-grown beast.

Carbonate and Bicarbonate of Soda are often of use in cases of indigestion and flatulence or hoven, especially in calves which are often relieved by 1 or 2 drachms of bicarbonate of soda dissolved in each meal if they are being fed by hand. Doses: Horses and cattle take 2 to 3 ounces, sheep and pigs 30 grains to 2 drachms.

Vinegar is in high repute as a cure for almost everything from gall-sickness to imaginary loose teeth, but it is very questionable whether it has any curative action whatever. There is a very common belief that it has the property of dissolving the hard contents of the third or leaf stomach (blaarpens), but any action it has in this respect is more probably due to its stimulant action or to other stimulants with which it is often combined, such as mustard or pepper.

Bluestone is a very good worm medicine but requires great care in its administration and in measuring and mixing the drug so that the proper strength which experience has shown to be safe may be obtained. Dr. Hutcheon recommended it for wire-worm (haarworm) in sheep, 1 lb. of bluestone to be dissolved in sixty bottles of water, and that 1½ ounces to 5 ounces of the solution be given to lambs and sheep, according to age. Three to six months old lambs getting 1½ ounces and so on until 5 ounces for those eighteen months old and over. It is always best to mix the quantity required for the whole lot and then dose a few to try the effect, picking out the weakest for

the experiment. Like all worm medicines the best results are attained when the sheep have been fasted for twenty-four to thirty hours and being kept away from water for the rest of the day on which the sheep are dosed. It is not safe to leave the dosing to natives as great care is required, for if a little only gets into the lungs inflammation of the lungs will be set up and may cause the death of the animal.

Stockholm Tar.—The writer has had success in the treatment of wire-worm in sheep by administration of Stockholm tar. The dose is one to two tablespoonfuls on the tongue, repeated two or three times with intervals of four or five days between the doses, and where sheep have got too weak to stand bluestone Stockholm tar will be found a safer remedy to use.

Calomel is often given in cases of gall-sickness and is a very useful remedy for this complaint. Cattle take 1 drachm or 60 grains, and it is best given dry on the tongue as it will not dissolve in water, and if put into a bottleful of water and well shaken up it will be found that the beast gets the water and the calomel all sticks around the inside of the bottle. A better plan is to place it dry on the back of the tongue, it can then be washed down with a bottle of water, eight hours afterwards give 1 lb. epsom salts dissolved in six bottles of water, the action of the salts being hastened if the water is warm. Calomel can also be given to dogs in 10 grain doses for biliary fever, in can also be used for the inflammation of the eyes which is so common in this country amongst cattle. A little of the dry powder either being blown into the eye or placed inside the lower lid, it will often clear up the so-called film in a few days. A little applied as a dry powder to saddle galls and sores quickly dries them up.

Cooper's Dip can be used as a very effective medicine if care is used in its administration, but as it contains arsenic it must be remembered that it is very easy to poison stock with it unless reasonable care is used. It is a very good worm and blood medicine, and is also a preventive of geilziekte in sheep. It is usually given dry mixed with common salt in the proportion of one part of dip powder to ten of salt, the dose of the mixture for a sheep being one teaspoonful, but for geilziekte it will be necessary to give three or four doses at intervals of four days. It will of course be unnecessary to point out that it is a very excellent dip for the cure of scab in either sheep or goats.

Jeye's Fluid, Little's Dip, Kerol, and dips of this type may be given internally, but small doses, say, up to half an ounce, are quite sufficient, and although very much larger doses may be given without appearing to do any injury, the desired result is attained with the smaller dose. In cases of chronic cases of indigestion in which the animal frequently becomes hoven, any of these dips are effectual in checking undue fermentation and acidity; for animals with sore mouths or injuries to the tongue or lips, a solution makes a nice gargle or mouth wash. As a dressing for wounds and for syringing out abscesses they are hard to beat, but of course must be used in weak solution, and in the treatment of strangles (nieuweziekte) in horses a little placed into some boiling water at the bottom of a bucket, then some hay, straw, or similar material placed on top so that the animal cannot scald his nose, and the bucket placed at the bottom of a sack with its mouth tied to the noseband of the headstall, will enable the animal to inhale the steam which arises,

and will bring away any discharge and help to bring matters to a head very much quicker than without the treatment.

Coffee and Tea.—Both these contain an active principle which is now considered to be identical. Strong solutions of coffee and tea are stimulants and may be given warm in cases where a better and more prompt stimulant cannot be obtained, but they require to be made strong and to be given in considerable quantity.

Lime-water is very easy to make and should be more used than it is, as it is very useful in the treatment of indigestion and diarrhœa in all classes of patients. Calves which are being fed by the bucket often cannot assimilate undiluted milk, and benefit is almost always derived by mixing the milk with one-fourth to one-third lime-water, which prevents acidity and also the coagulation of the milk into large tough indigestible masses. Lime-water is prepared by adding 2 ounces of slaked lime to six bottles of water, stirring briskly, allowing the undissolved matter to subside, and after a few hours pouring off the clear solution which is to be used.

Carron Oil should be ready in every house as it is a simple and effective application for scalds and burns for either human beings or animals, and a couple of bottlefuls with the addition of two ounces of tincture of opium is recommended as a cure for tulp poisoning. Carron oil is made by shaking well together equal parts of lime-water and raw linseed oil.

Oil of Eucalyptus is found in most houses and can be used in most cases where turpentine would be used, but the dose must not be more than half an ounce for horses or cattle, and it must be given in either a bottle of weak dop and water or in a bottle of milk.

Mustard, although not much used internally, is of very great service as a blister; a paste is made with cold water (not hot) and rubbed well into the part, left on for twenty minutes, and then washed off or it is apt to leave a blemish; as an illustration of where it may be used it can with advantage be applied to any slowly forming abscess that it is desired to bring to a head, such as the one between the lower jaws which usually develops in strangles (nieuweziekte). Two or three dressings well rubbed in will either cause it to burst naturally or will make it so ripe that it may be opened with a pocket knife, afterwards syringing out with a weak solution of dip.

Ginger and Cinnamon may be given with epsom salts to check undue griping, or with bicarbonate of soda for indigestion, or with stimulants or turpentine and oil in cases of colic in doses of one ounce each for horses and two ounces for cattle.

Chillies, Cayenne, and Black and White Peppers may also be used in a similar manner if so desired, but not more than one drachm should be given to horses or two drachms to cattle as large doses irritate.

DOGS can be conveniently treated by using many of the pills which are in common use, such as Beecham's, Carter's Little Liver Pills, Blaud's tonic pills, etc.; the actions are the same as for human beings and the dose for a very large dog being about the same as for a full-grown person, a small terrier taking about the same dose as a young child.

In this article when a "bottle" is used as a measure an empty whisky bottle is meant, and as no proper measures may be available,

the following domestic utensils may be used. Common tumblers contain from eight to ten fluid ounces, teacups five to seven fluid ounces, wine glasses two fluid ounces, tablespoons half a fluid ounce, dessertspoons two fluid drachms, teaspoons one to two fluid drachms, a drachm being sixty drops or minims.

In conclusion, do as little "doctoring" as possible; don't use powerful drugs, always give fluid medicines by the mouth, *not by the nose*, trust more to good nursing than doctoring, tempt your patient to eat by giving a little and often, always remove the remains of the last feed. If it is necessary to bottle food or liquid down the animal remember there are such things as milk, milk and lime-water, well-made gruel, milk with a little dop or whisky, tea made by pouring boiling water on to lucerne hay and allowing it to cool, etc., and either move the animal into the shade or build a temporary shelter of sacks over it; if unable to stand do not let it lie on one side for long, turn it over or prop it up with sacks filled with sand, and don't take the advice of ten people at once—try one at a time.

Castration of the Stallion Standing by means of the Ecraseur.

(Paper read before the Transvaal Veterinary Medical Association at Pretoria on 25th March, 1911.)

By J. J. EDGAR, Government Veterinary Officer, Zoutpansberg.

I ADVISE that the stallion to be operated on should on the previous evening and on the morning of the operation be given a sparing diet. A good loose box is the most convenient place in which to carry out the operation. The animal should be properly secured; for this the bridle

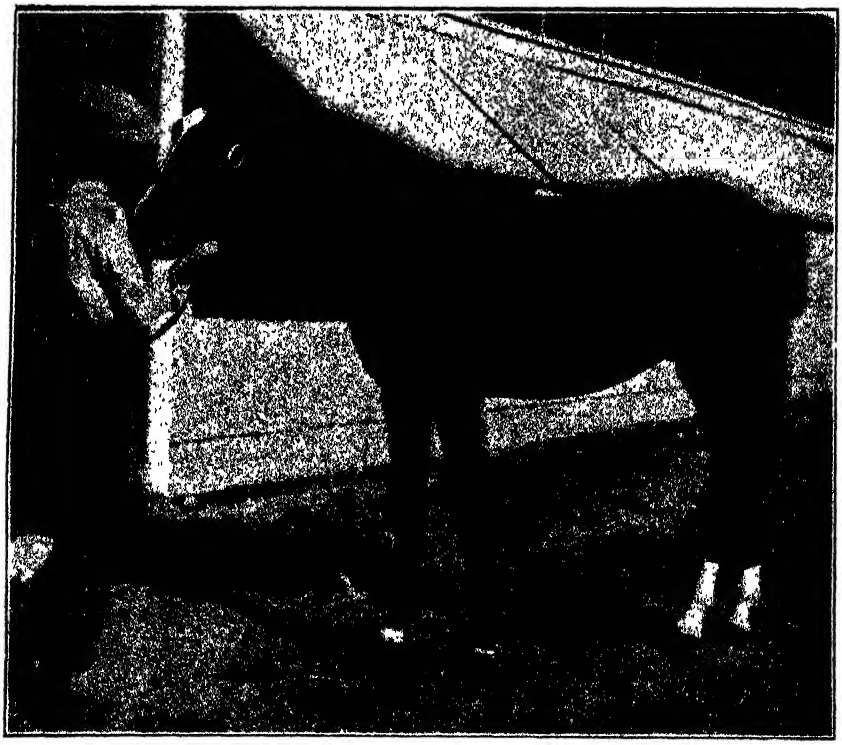

Fig. 1. The stallion to be operated on.

with blinkers and twitch are all that is necessary. The twitch having been applied, the holder stands on the left side with his right shoulder against the near shoulder of the horse with the horse's head held inclined somewhat to the near side. The twitch should not be applied too severely, neither should the animal be held too firmly, as if such be done the result, at, or even before you have started the operation on the animal, may be that he will throw himself down. A medium

control ought to be established, and should the animal show a tendency to move forward allow him to do so, but the holder of the twitch should counteract this forward tendency by making him move in a circle—the operator moving also—but both keeping their original positions. The operator stands on the left side, passes his left hand along the abdomen as far as the scrotum, grasps the right testicle and exercises strong and steady traction, gradually getting the testicle into a position easily to deal with; when in position a good firm grip is maintained and the scrotum is immediately opened with a knife in the right hand by a bold incision into the substance of the testicle, dividing all the coverings, and along its whole length from before, backwards, the wound being made well forward. The knife is then

Fig. 2. Showing the method of holding the animal during the operation.

discarded; the left hand grasps the protruding testicle and spermatic cord while with the right hand the chain of the ecraseur is passed over the testicle above the epididymis as high as possible and drawn tight without exercising any violent strain on the cord. The left hand is now employed in grasping the chain, testicle, and spermatic cord, while the right hand is used to turn the screw of the ecraseur, dividing the cord above the epididymis. The second testicle is removed in a similar way, the operator making sure while applying the chain that no part of the scrotum is included. Immediately the actual operation is complete it is usual to splash the parts with a half bucket of cold water containing some antiseptic, then giving the tail one or two sharp pulls in an upper direction, both actions tending to cause retraction of the spermatic cords and the former to cleanse the parts.

The actual time taken to the operation averages four minutes. The horse ought now to be placed in a well-ventilated loose box and left quietly alone, and as feeding distracts attention from the operation it should be given some grass or hay to eat. The following and successive days the animal should be turned out to graze or exercised, and in the course of from eight to ten days' time after the operation should be put to light work again. Yearlings should be turned out in paddocks. The object and the action of the ecraseur is to crush rather than to cut the tissues, and the matter of the rapidity of screwing the instrument in my own opinion makes little material

Fig. 3. Grasping the testicle with the left hand and holding the knife in the right preparatory to incising.

difference in the practical results obtained. Some operators, however, hold "that the action depends to some extent on the rapidity with which the process is carried out. The slower the movement the less bleeding. For this reason very vascular tissues should be very slowly divided and pauses should occasionally be made between each complete rotation of the screw; fifteen to thirty seconds may be allowed to elapse".

There are several forms of ecraseurs; some good, others indifferent. All are not suitable for castration, and many have serious defects which you can readily realize by comparing this one belonging to the Agricultural Department with my own. The difference is palpable; the former being too wide in the mouth and having sharp cutting

edges and would not produce the required crushing, which I consider of importance to arrest hæmorrhage. I would, therefore, recommend you to discard it in favour of the one similar to what I use; note its narrow mouth and blunt edges. Speaking about ecraseurs, I prefer the Farmer Miles pattern with bevelled chain; it is the most practical instrument on the market, but to make it a complete and practical instrument I would suggest that Professor Dewar's patent catch be applied to it for the purpose of taking up the slack to do away with so much unnecessary screwing. The usual dangers after the operation in this method are to be looked for as in any other method. They are (1) hæmorrhage from the spermatic vessels; (2) infective inflammation of the spermatic cord and extension causing peritonitis; (3) swelling.

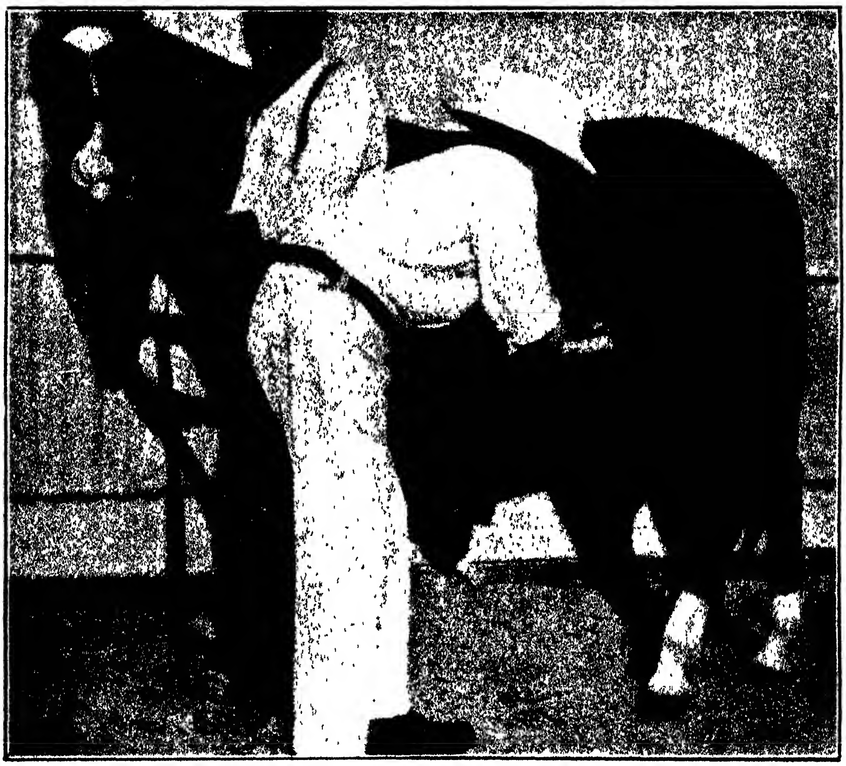

Fig. 4. Applying the Ecraseur before removal.

Happily, I am unacquainted with the two former, only having had the usual swelling due to the retension of wound discharges to deal with. I find that the wounds close up so rapidly in this country that I now make it a point of having them opened on the third or fourth day after the operation; it is seldom that a second opening is required. The method of opening the wound is as follows:—The hands are well washed and the fore-finger is smeared with some antiseptic solution, preferably carbolic oil, the wound adhesions are broken down with the finger and any irritant discharge allowed to

escape, and finally, wash the parts with clean cold water containing some antiseptic solution.

An unusual danger that I have occasionally experienced, and more especially as a beginner of the operation, has been accidently sending the knife into the internal saphena vein which lies in the superficial inner aspect of the off thigh—in such a case the blood streams down the inside of the leg—but the hæmorrhage in such cases as I have witnessed has soon ceased without interference; the saphena artery which lies in front of the vein might also be accidently opened through the knife slipping, but the chances are less of it being injured as it is a long and slender vessel. Without in any way advocating one method of castration in preference to any other, my own experience of sixteen

Fig. 5. Splashing the parts after the operation is completed.

years, during which time I have successfully operated on many animals of the equine species of all ages, both at Home and in South Africa, has led me to come to the conclusion that the ecraseur is a valuable instrument to the veterinary profession, and that used either standing or cast the method is quick and practical and devoid of any real serious risk or danger; but as in all other methods as well as in this one, one must never forget that handiness and cleanliness are the two principal factors in the secret of the success of the operation. I may mention that I have also been equally successful with the ecraseur in that most dreaded operation (from both the farmer and the transport-riders' point of view of castrating) in the donkey, but first casting and tying this animal. The best period of the year for the operation in the part of

this country where I am stationed I consider between the first of September up to Christmas.

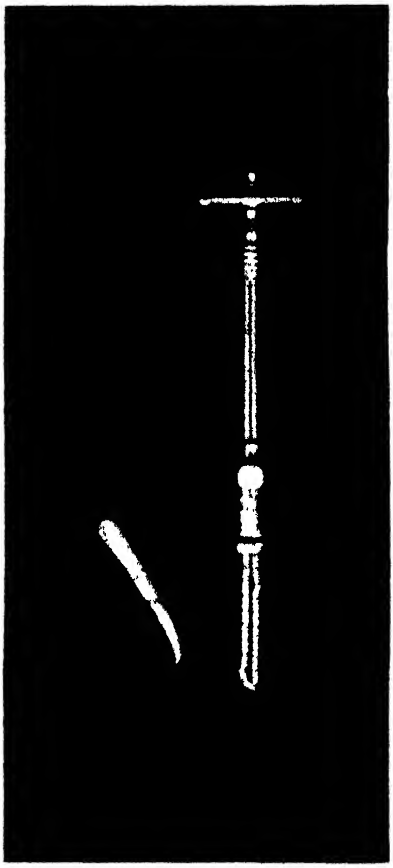

Fig. 6. The Ecraseur and Knife the only instruments required.

After the reading of the paper two horses were successfully castrated for exhibition.

To illustrate the method I append a few photos.

Experiments with Ostriches—XX.

THE ANATOMY AND PHYSIOLOGY OF THE OSTRICH.

C.—THE INTERNAL ORGANS.

By Professor J. E. Duerden, M.Sc., Ph.D., A.R.C.S.,
Rhodes University College, Grahamstown.

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Introduction.

Dissection of an Ostrich Chick.—Fixing for Dissection; Removal of the Skin; Cutting open the Body-cavity; Organs in the Thoracic Region; Organs in the Abdominal Region; Dissection of the Separate Organs; Dissection of an Adult Ostrich.

1. *The Digestive System.*—The Food-pipe, Gullet or Œsophagus; the Stomach; the Intestine; the Small Intestine; the Yolk-sac or Yolk-stomach; the Cæca; the Large Intestine; the Cloaca; the Liver; the Pancreas; the Spleen or Milt.
2. *The Respiratory System.*—The Trachea or Windpipe; the Lungs; the Air-sacs.
3. *The Excretory System.*—The Kidneys.
4. *The Circulatory System and Blood Pressure.*
5. *The Reproductive System.*—The Male Reproductive Organs; the Female Reproductive Organs; the Egg.
6. *The Nervous System.*

INTRODUCTION.

For the performance of its animal functions, such as those of locomotion, digestion, breathing, excretion, and reproduction, the ostrich is provided with various organs, all of which are nourished with blood from the heart and controlled and regulated by the nervous system.

The organs are arranged in systems according to the special purpose they fulfil. These are as follows:—

1. *The Digestive System.*—This is concerned with the preparation or digestion of the food taken in so as to reduce it to a soluble and assimilable form capable of nourishing the various organs and tissues. It consists of the alimentary canal or food canal, comprising the mouth, gullet, stomach, large and small intestine, cæca, and cloaca, as well as the liver and pancreas. The latter are glandular outgrowths of the alimentary canal which secrete digestive juices poured upon the food to digest it.

2. *The Respiratory System.*—The purpose of this is to provide for the taking in of pure air, the exposing of it to a large surface of blood so that an exchange of gases can take place, and the expiration of the impure air. The breathing organs consist of the trachea or windpipe, the lungs, and the air-sacs, the latter being peculiar to birds.

3. *The Excretory System.*—The excretory system provides for the getting rid of the waste products of the body and the surplus water. It includes the kidneys and their ducts, the ureters, which terminate in the cloaca.

4. *The Circulatory System.*—This is for the purpose of carrying on exchanges in the blood in all parts of the body; the blood conveys the nutritive materials and gases of the organs and brings away the waste products. The work is performed by the heart and blood-vessels, the latter sub-divided into arteries and veins and their fine microscopic terminations the capillaries.

5. *The Reproductive System.*—The reproductive system is concerned with the production of fertile eggs from which new individuals—chicks—are derived. The part assigned the two sexes is different, hence there is a difference in the reproductive organs of the cock and the hen. In the male are the pair of testes or testicles which produce the male cells or spermatozoa, the sperm ducts or *vaza deferentia* which convey them to the cloaca, and the penis which conveys them into the cloaca of the female; in the female is the single ovary which produces the female cells, ova, or eggs, and the egg-tube or oviduct which forms the "white" of the egg, the shell-membranes and the shell, and then conveys the eggs to the exterior. In the hen is also a small clitoris corresponding with the penis of the cock.

6. *The Nervous System.*—The purpose of the nervous system is to control and regulate all the functions and activities of the body. This is carried out by means of the brain, spinal cord, and the nerves connected with them. By means of various sensory organs, the eyes, ears, and nose, acting through the nervous system, the ostrich is made aware of external conditions and acts accordingly.

DISSECTION OF AN OSTRICH CHICK.

It is important that the farmer should have some acquaintance with the appearance and relationship of all the organs of the ostrich, both in health and disease, as such knowledge often assists in an understanding of the various diseases to which the bird is subject. To do this it is necessary to make dissections on the death of a bird. For obtaining a general acquaintance with the internal parts of the ostrich a chick is nearly as suitable as an adult, while the dissection can be carried out much more conveniently. If the directions given below are carried out the details mentioned can be readily made out on the specimen. The whole can be accomplished in two or three lessons, lasting an hour or two each. The only instruments required are a sharp knife and a pair of scissors.

Fixing for Dissection.

The dissection of an ostrich chick is best carried out by laying the chick on its back on a flat board and then looping the legs and wings by means of twine to four nails stuck in at convenient distances apart and forming a square. By this arrangement the body is held on the stretch with the legs and wings outspread. It is advisable first to pluck out the feathers over the ventral surface, from the neck to the cloacal aperture, noting at the same time the well-defined feather tracts (*pterylia*) and the intervening featherless areas (*apteria*).

Removal of the Skin.

The thin greenish yellow skin is now raised a little from the body and by means of the knife or scissors a cut is made along the

middle line, extending forwards up the neck to the floor of the mouth and backwards as far as the projecting bone forming what is known as the pubic symphysis.

The whole ventral surface is now skinned by cutting through or tearing the connective tissue which binds the skin to the body-wall below. The separation is carried out over the whole length of the neck and part way along the wings and legs, side cuts being made in the skin the better to expose the limbs. In the middle line of the skin, some distance from the end of the body, may be seen a scar, representing the shrunken remains of the navel cord, the yolk-sac having slipped through its aperture, the navel, into the body just before hatching.

Turning back the loose skin on each side, the following can now be observed. In the neck, the long oval trachea or wind-pipe passing from the back floor of the mouth down the mid-ventral line of the neck into the body-cavity. The numerous gristly or cartilaginous rings which serve to keep open the tube can be easily seen and felt. At its lower end the trachea divides into the two bronchi, and at the same place, just where the neck joins on to the body, is a very thin transparent membrane, the ventral wall of the median interclavicular air-sac.

Running along the right side of the trachea is the soft-walled, collapsed food-pipe, gullet, or œsophagus. This also begins at the back part of the floor of the mouth, but dorsal to the trachea, and emerges on the right to pass alongside the latter. The gullet is somewhat pouch-like at its origin, the food collecting here before being swallowed.

On each side of the neck, at the place where it joins on to the body, can be seen two small, rounded, flat-like bodies, the thymus gland. Most of the blood-vessels and nerves of the neck can be observed without further dissection.

On the long, plump, oval body can be made out the rather narrow anterior thoracic region* covered in the middle by the cartilaginous sternum and at the sides by the ribs, joined one to the other by intercostal muscles. This is followed by the abdominal region of the body, of much greater size than the thorax, and having a very thin, dark-coloured membranous wall, with a large, thin, curved patch of muscle at the sides. At the extreme end of the body can be felt the curved portion of the pelvic girdle forming on the mid-ventral wall the pubic symphysis. Just below the sternum can be felt the hard stomach.

Cutting open the Body-cavity.

Raising now the body-wall in the middle, an incision is made along the middle line and carried forwards through the gristly breastplate to the front end of the body and backwards to the symphysis, taking great care that the point of the knife or scissors does not penetrate any of the folds of the intestine which lie close against the wall. The wall must be cut free from its attachment to the stomach and intestines and from the other membranes in the thorax. On now cutting away the sides of the body-wall, including the sternum and the ribs for half their length, or folding them to

* The thoracic and abdominal parts of the body in the bird do not altogether correspond with those in mammals. In birds there is no true musculo-tendinous diaphragm and the liver is thoracic in position, lying on each side of the heart.

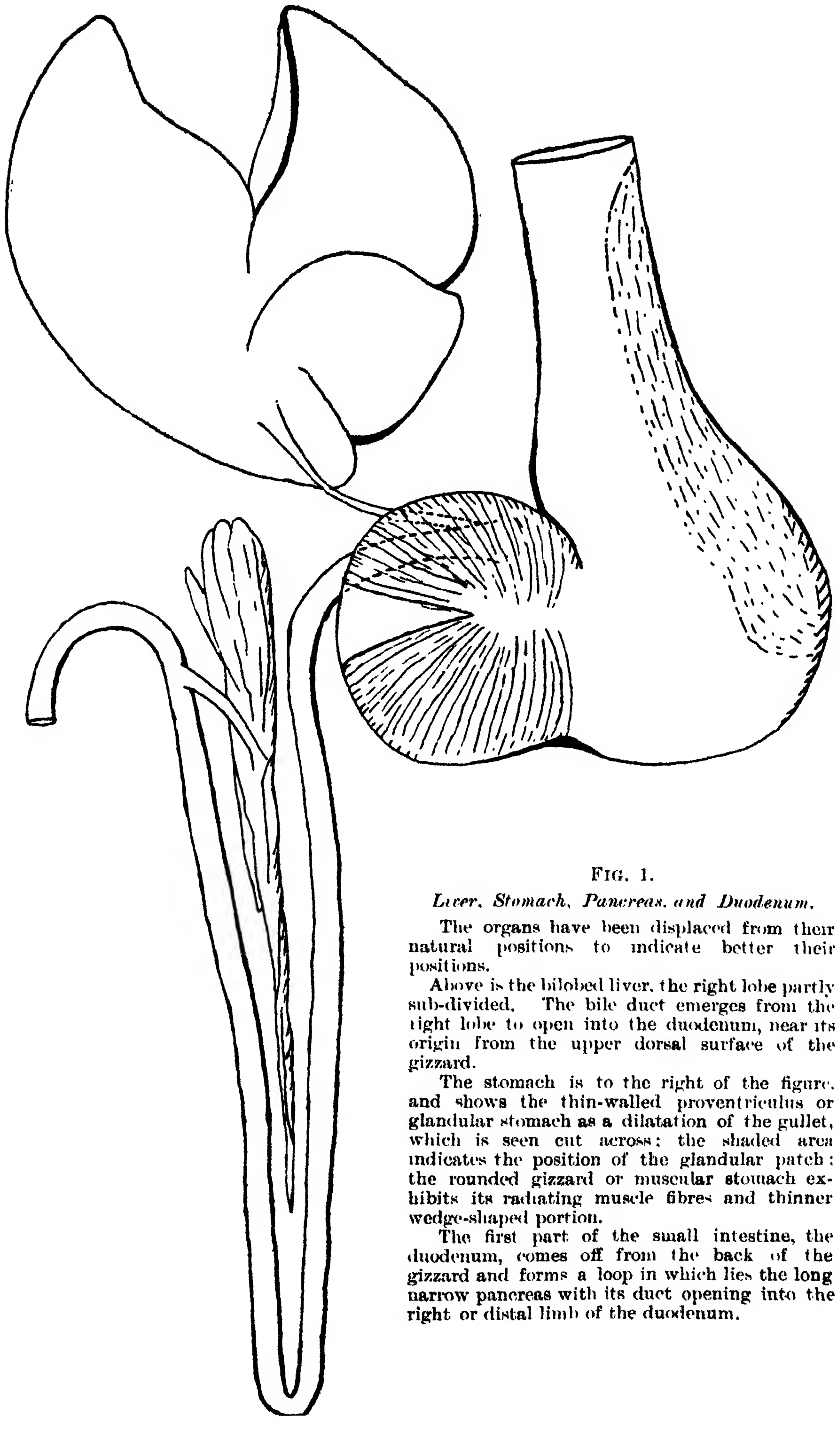


FIG. 1.

Liver, Stomach, Pancreas, and Duodenum.

The organs have been displaced from their natural positions to indicate better their positions.

Above is the bilobed liver, the right lobe partly sub-divided. The bile duct emerges from the right lobe to open into the duodenum, near its origin from the upper dorsal surface of the gizzard.

The stomach is to the right of the figure, and shows the thin-walled proventriculus or glandular stomach as a dilatation of the gullet, which is seen cut across; the shaded area indicates the position of the glandular patch: the rounded gizzard or muscular stomach exhibits its radiating muscle fibres and thinner wedge-shaped portion.

The first part of the small intestine, the duodenum, comes off from the back of the gizzard and forms a loop in which lies the long narrow pancreas with its duct opening into the right or distal limb of the duodenum.

the sides, the entire body-cavity, filled with the various organs, is displayed. If much liquid is present it indicates an unhealthy condition. Without any further dissection the following can be made out:—

Organs in the Thoracic Region.

In the front part of the body is the conical heart contained in a separate cavity, the pericardium, and with the great blood-vessels connected with its broader end. On each side of the heart is the dark red bilobed liver, each half also contained in a separate cavity. The thick vertical membrane dividing the liver into two, and now severed from its attachment to the body-wall, is the suspensory or falciform ligament, and the transverse membrane forming the hinder boundary of the two liver cavities is the coronary ligament. The side membrane against which the liver rests is the oblique ligament. Between the oblique ligament and the ribs are seen three chambers with thin transparent partitions; the first two of these are the anterior and posterior intermediate air-sacs, and the third longer one is the abdominal air-sac. Looking at the floor, or rather roof, of the air-sacs is seen a portion of the pink lungs, and on their surface may be observed the openings by means of which the lungs communicate with the air-sacs.

Organs in the Abdominal Region.

Behind the smaller thoracic part of the body is the abdominal region. Note that the thin glistening lining of its wall, known as the peritoneum, is deeply figmented, being almost black in colour. The large double stomach is seen lying across the body, and the coiled intestines occupy practically the rest of the cavity. The stomach and intestines are all bound and held together by very thin transparent membranes, the mesentery, which is really a reflection of the peritoneum from the dorsal surface and receives different names in different regions. When the mesentery is put on the stretch, as by lifting up some of the intestines, various blood-vessels and nerves will be found in it, passing to and from the various viscera.

In the *stomach* (Fig. 1) note the division into two parts, the glandular stomach or proventriculus with thin walls, and the muscular stomach or gizzard with greatly thickened walls. The glandular stomach is really an enormous enlargement of the gullet, and on its outer border can be seen a thickening, indicating the position of the glandular patch on which are situated the gastric glands. In this region will also be seen the somewhat cylindrical, dark-coloured spleen, attached by mesentery to the stomach. The muscular stomach is nearly circular in outline and very firm, the muscle fibres radiating from the centre. Turning it over, so as to expose the dorsal surface, the commencement of the first part of the small intestine, known as the duodenum, can be seen and the bile-duct from the liver opening into it.

As the *intestines* lie in position different portions can be made out by slightly turning them aside without any dissection. Lying along the hinder border of the stomach is the duodenum, with pale-coloured walls and bent upon itself into what are known as the ascending and descending limbs. In the mesentery connecting the two limbs lies the pancreas, an elongated, partly divided gland, extending more than half-way down the length of the loop and somewhat above it. From about its middle is given off the single pancreatic duct,

which pours the secretion of the pancreas into the duodenum towards the upper end of the ascending limb. The duodenum is continued into another part of the small intestine usually known as the jejunum, and this into the ileum, but in birds there is nothing to delimit these

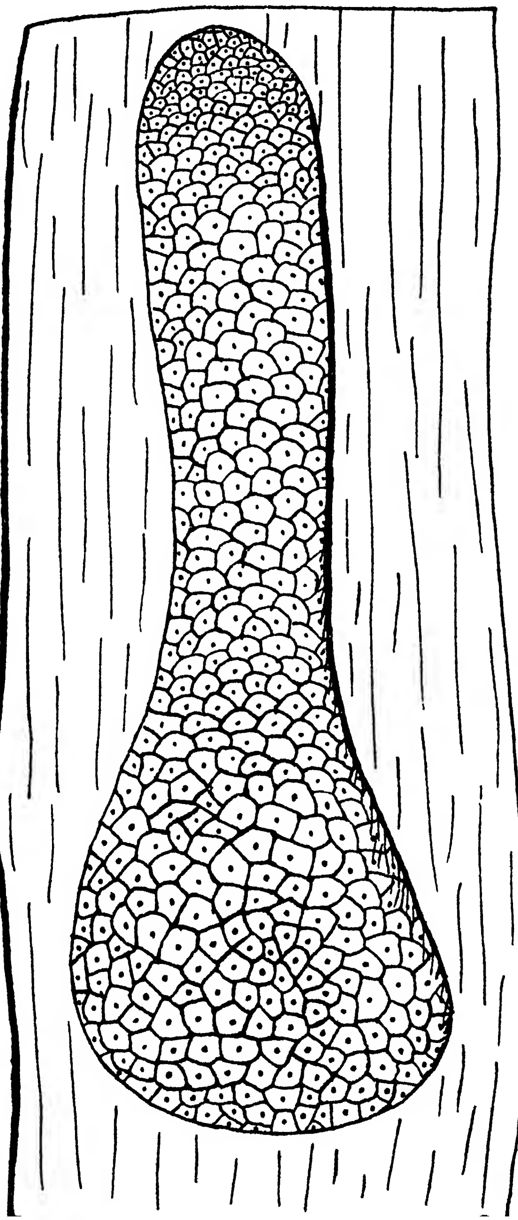


FIG. 2.

Portion of wall of proventriculus or glandular stomach flattened out to show the form of the glandular patch with the gastric glands. It is among these glands that the wire-worm occurs

regions. Their coils can be easily followed among the rest of the intestine on account of the smooth, light-coloured nature of the wall.

The *large intestine* follows upon the small intestine and is readily distinguished by its dark walls, due to the colour of the contents, and

by a shallow spiral groove on the outside which corresponds with a spiral fold inside. At the junction of the large and small intestines two long intestine-like tubes are given off, which end blindly and are known as the cæca. They can scarcely be followed at this stage but are easily studied when the intestine is unravelled. Separate pellets of more or less dry dung may be seen in the large intestine as it approaches its termination. The rectum, or terminal part of the large intestine, ends in the cloaca, which is a swollen body at the extreme end of the cavity, and opens to the exterior at the vent. If the intestines are turned over entirely from one side to the other, so that the dorsal wall of the body is exposed, the dark trilobed kidneys can be indistinctly seen lying in depressions in the pelvic cavity. If the chick is a cock two light-coloured testes may be seen overlying the uppermost lobe of the kidneys, and, if a hen (Fig. 4) the single ovary on the left kidney, along with its thin-walled oviduct.

Dissection of the Separate Organs.

Having made a preliminary survey of the organs and noted their attachment and relationship to one another they can now be studied in detail by removing certain parts and by further dissection.

First unravel the *intestines*, beginning with a cut at the distal limb of the duodenum beyond the opening of the pancreatic duct. In unravelling cut through or tear the mesentery to which the intestine is attached throughout its length. When the whole of the small intestine is straightened out the two cæca must be unravelled separately and with care. The unravelling of the large intestine should now be proceeded with, and then cut off about an inch from the cloaca. Measure the entire intestine when straightened out and remove it to a dish containing water. Slit open the various parts to observe the nature of the internal walls and to look for parasites. Wash under water if necessary.

Next remove the *duodenum* and the stomach, cutting the latter free as high as possible up the gullet (Fig. 1). Note better the form of the pancreas and the place of origin of the duodenum from the gizzard, and also the course of the bile and pancreatic ducts. Open the stomach and note and clear out its contents. Observe the comparative thinness of the wall of the glandular stomach and the great thickness of the wall of the gizzard; also the yellowish hard internal coating, which readily peels off. Make out carefully the position and nature of the glandular area in the proventriculus, with the large number of gastric glands.

Remove the liver by cutting through its attachments, noting especially the large blood-vessels, the hepatic veins, and the inferior vena cava. Observe the form of the liver on both its ventral and dorsal surfaces and the absence of any gall bladder.

Remove the heart by cutting through the blood-vessels as far as possible away from the organ. Make transverse sections through the heart so as to observe its chambers, the two auricles and two ventricles, and the valves which separate them.

Separate the *trachea* from its connections and cut it through about the middle of its length; then follow it downwards until it divides into the two bronchi, noting the syrinx or voice-box at the place of division. Remove the walls of the air-sacs and membranes covering the lungs, and carefully separate the latter from their close adherence to the ribs and backbone. Transfer the trachea and the

lungs hanging from them into a dish, and slit down the bronchi and follow them into the lungs, noting their various apertures which communicate with the air-sacs.

Expose better the *kidneys* (Fig. 4) by removing the tough membrane covering their surface and note their colour, form, and granular character, and blood-vessels passing over their surfaces; follow the short ureter coming from the inner side of the lowest lobe and passing down to open into the cloaca. At the top of each kidney is a yellowish adrenal body. In the male chick note the position and attachment of the pair of testes and the *vas deferens* coming from each to open into the cloaca; in the female chick the left single ovary only is developed, lying on the inner border of the uppermost kidney lobe. The left oviduct even in the chick is a fairly large tube opening into the cloaca just outside the ureter; a rudimentary right oviduct can be made out.

Slit open the cloaca (Fig. 1) and wash it out. Note its three chambers with their apertures, and also the penis in the male and the clitoris in the female. Into the uppermost chamber opens the rectum: into the middle chamber the right and left ureters and the two *vasa deferentia* or single oviduct according as the chick is a male or female.

If it is desired to dissect out the *brain* (Fig. 5) cut off the head, remove the skin covering it, and carefully cut or chip away the bony covering, when the brain can be seen immediately below. By completely removing the bone above and at the sides the brain can be ultimately got out in its entirety, the cranial nerves having to be cut through.

DISSECTION OF AN ADULT OSTRICH.

On account of its size the dissection of an adult bird will generally be performed on the ground, unless a strong low table is available. The legs and wings serve to keep the body in position on its back. The medium incision through the soft part of the ventral body-wall is made in the same way as in the chick, but it will be found impossible to cut through the sternum, now become bony, with a knife or scissors; hence a saw must be used to cut through the ribs on each side of the breast-plate, when the latter can be lifted up and detached from its connection with the organs. If a saw is not available it may be possible to find the junction between the sternal and vertebral ribs and cuts made through them. The skin and muscle connecting each leg with the body-wall must be cut through, when the leg falls to the side; also if the strong tendons at the back of the ankle-joint are severed the leg will lie straight and flat, instead of bent upwards.

The only important differences, other than that of size, between the organs in the chick and those in an adult bird, will be in connection with the reproductive organs. The ovary and testes and their associated ducts will have assumed their more characteristic features, and the clitoris and penis their full size.

The individual systems of the ostrich will now be described in fuller detail.

1. THE DIGESTIVE SYSTEM.

The *digestive system* of organs commences at the mouth and terminates at the cloaca. It includes a continuous, much coiled tube, the alimentary or food canal, varying in diameter and the thickness

of its wall in different regions, and having two large glandular outgrowths, the liver and pancreas, connected with it. The tube is lined throughout by a mucous membrane provided with mucous glands, which secrete mucus or slime, which renders easy the passage of the food through it. Other glands, however, occur in places, as in the gullet and stomach, and secrete special digestive juices. Below the mucous layer are at least two layers of muscles, circular and longitudinal, which produce the peristaltic movements of the canal by means of which the food is forced along from one end to the other.

Food taken in through the mouth is acted upon in various ways while in the alimentary canal, so that it is rendered soluble and diffusible. It then passes through the walls and into the blood circulation, to be distributed to all the parts of the body. The innutritious undissolved portions of the food pass out at the other end of the canal through the cloacal aperture or vent as fæces or dung.

The germs of parasites, such as those of the wire-worm and tapeworm, are taken into the alimentary canal along with the food eaten and lodge in various places where they flourish, surrounded by an abundance of food. On maturing they lay their eggs, which become mingled with the fæces and are carried along with it, and escape from the body to infect the ground still further.

The *mouth*, the first part of the food canal, has already been described in dealing with the external characters of the ostrich.

The Food-pipe, Gullet, or Œsophagus.

The *gullet or food-pipe* commences at the back part of the mouth, known as the pharynx, by a semicircular aperture, its two sides almost surrounding the upper end of the wind-pipe. As seen in a dissection it originates dorsal to the trachea (Fig. 3), but soon emerges from above the latter to pass parallel with it down the neck on the right side. The first part of the gullet is pouch-like and serves to hold the food while feeding, until, the bird raising its head, the food drops into the narrower part of the tube and is forced downwards by means of the peristaltic action of the walls. The course of the food-swallowing is easily followed from the outside, giving the appearance of moving in a spiral, as it passes from the middle of the throat to the side of the neck. The wall of the gullet is soft and very expansible, stretching and collapsing as the food passes down, very different from the trachea, the lumen of which remains always open and of the same diameter. The internal mucous lining is richly supplied with mucous glands which keep the surface of the tube moist and slimy and thereby facilitate the passage of the food.

As it enters the body between the sternum and vertebral column the œsophagus gradually enlarges in size until it ultimately expands to form the proventriculus or glandular part of the stomach. The patch of gastric glands characteristic of the first part of the stomach extends some way up the gullet (Fig. 1).

In many birds, such as the pigeon and fowl, the gullet forms an enlargement in its course, known as the crop, in which food is stored before passing to the digestive stomach; but the ostrich has no trace of such an expansion, the tube being of nearly equal diameter all the way, excepting the enlargements at each end.

The Stomach.

The *stomach* (Fig. 1) is divided into two very distinct parts: the glandular stomach or proventriculus, appearing as an enormous

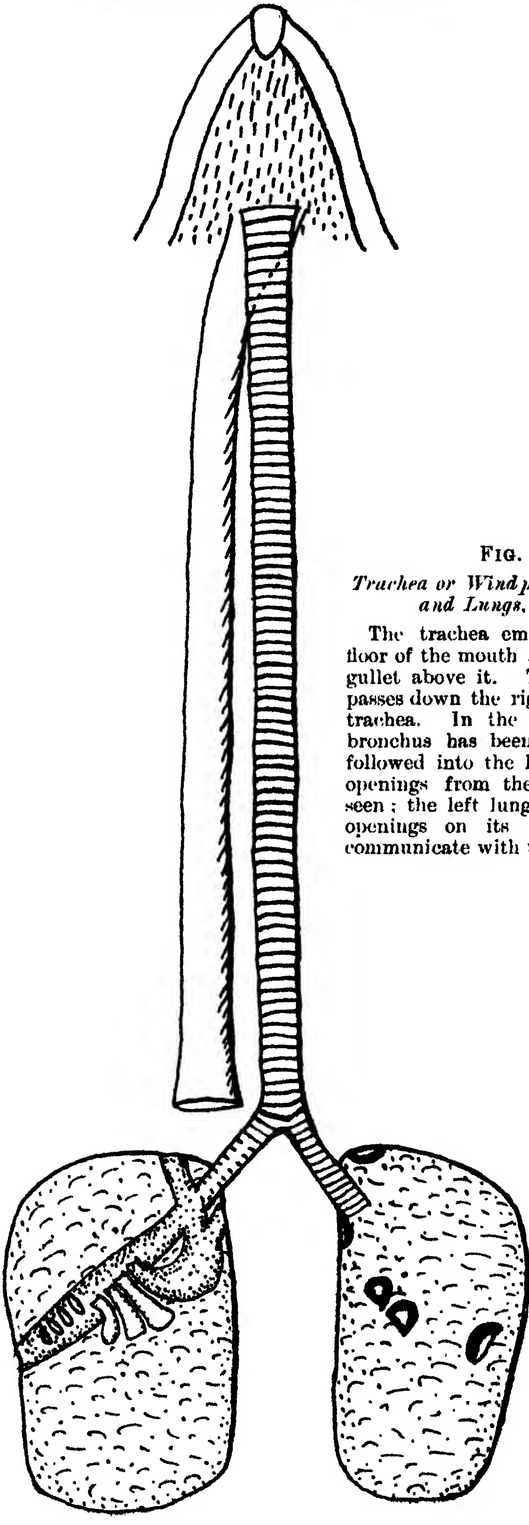


FIG. 3

Trachea or Windpipe, Bronchi, and Lungs, Gullet.

The trachea emerges from the floor of the mouth along with the gullet above it. The gullet then passes down the right side of the trachea. In the right lung the bronchus has been slit open and followed into the lung where the openings from the vestibule are seen ; the left lung shows the five openings on its surface which communicate with the air-sacs.

dilatation of the gullet, and the muscular stomach or gizzard, rounded, with very firm thick muscular walls. The organ lies across the body, just below the sternum, the gizzard turned a little upwards and firmly attached to the ventral body-wall, a condition different from that occurring in most animals and rendering dissection somewhat difficult. The size, especially of the glandular stomach, varies much according to the amount of its distension with food.

The *glandular stomach or proventriculus* is not sharply marked off from the gullet, but appears as a greatly enlarged part of it. Its walls are smooth, comparatively thin, and lined internally with a rather thick yellowish membrane which readily strips off. On its upper outer wall is a large, pale, elongated, thickened patch, about 12 inches long in the adult, to which are restricted the gastric glands, about 300 in number (Fig. 2). These are closely arranged as small mammillated elevations, each with a minute aperture in the middle, which is the opening of the main duct. The surface of the area in a state of health is covered with a thin membrane, which must be stripped off to expose the glands more distinctly. The gastric glands secrete a digestive fluid which drops down upon the food contained in the stomach and acts upon it before passing to the gizzard where it is finely ground up. In making post-mortems stones and grit are usually found in the glandular stomach, but these must be regarded as having escaped from the gizzard; under normal conditions stones do not accumulate in the proventriculus.

The *glandular patch* on the wall of the proventriculus (Fig. 2) is the seat of the most serious parasite with which the ostrich is infested, namely, the wire-worm, *Strongylus douglassii*. Very few birds seem to be free from the disease, and when present in enormous numbers they often lead to the death of the bird by stopping the reaction of the gastric juice or partly destroying the wall of the stomach. The worms first attack the surface of the mucous membrane, and ultimately penetrate into the actual substance of the glands, where they set up inflammation of the walls. This in the end results in the stoppage of the secretion of the gastric glands or even the complete destruction of the glandular area, the effects of the attack varying in different individuals. The presence of the parasites also leads to the formation of a white gelatinous exudation, which covers the surface of the glandular area and effectually prevents the gastric juice from flowing; also, unless removed, the exudate interferes with any remedies reaching the wire-worm.

In severe cases the mucous and sub-mucous layers of practically the entire stomach may be attacked by the strongyle, and the exudate may be as much as a couple of inches in thickness.

The *gizzard or muscular stomach* (Fig. 1) continues the proventriculus almost across the body, but is turned somewhat forward, and its upper half is firmly attached to the ventral body-wall. Externally it is sharply separated from the glandular stomach by a shallow groove and by the thickness of its walls, the muscles of which radiate from near the middle. The walls, however, are not uniformly thick, as a wedge-shaped thinner part occurs at the middle of its right border. From the upper dorsal surface of the gizzard and near the proventriculus comes off the first part of the small intestine, the duodenum, which is swollen at its origin near which it receives the bile-duct from the liver.

On cutting open the gizzard it is usually found filled with food in process of being ground up, the operation being assisted by the small pebbles and grit which are always present. The inner wall is covered with a thick, yellow, dense membrane which easily strips

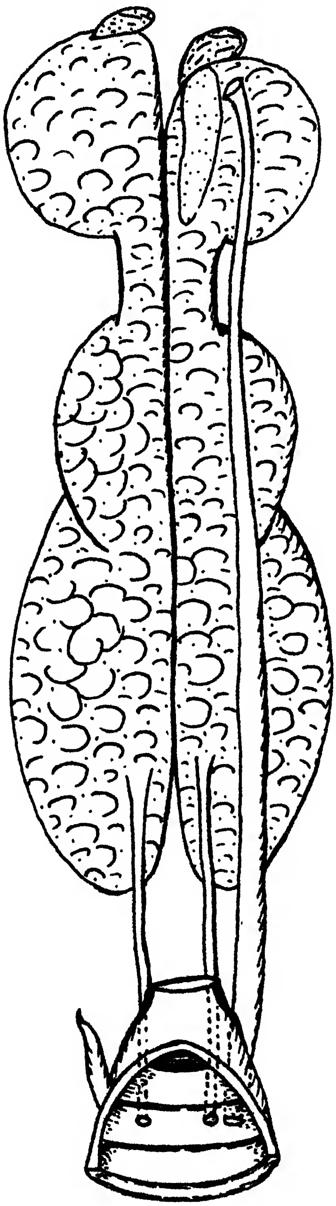


FIG. 4.

Kidneys, Ovary and Oviduct, Cloaca.

The right and left kidneys come together in the middle line. Each is trilobed and the left is a little lower than the right. At the top are the small rounded adrenal bodies. The ureters come off from the lowest lobe and open into the middle chamber of the cloaca below.

The single ovary lies over the first lobe of the left kidney and the oviduct commences near it and passes as a straight tube to open into the cloaca near the opening of the ureter. The rudimentary right oviduct is seen on the other side.

The cloaca is drawn with its ventral face removed so as to show the three chambers inside and the openings into them.

off. The passage between the glandular and muscular stomach is large and open, that between the muscular stomach and intestine is guarded by the pyloric valve provided with a sphincter muscle, which only allows the food to pass after it has been sufficiently ground up and acted upon by the digestive juices.

The Intestine.

The *intestine* is an enormously long, convoluted, thin-walled tube, starting from the stomach and ending in the cloaca, and occupying nearly the whole of the middle and hinder part of the body-cavity. In a chick about a month old its total length, when unravelled, measured over twenty feet, while in an adult bird one measured over sixty feet. This great length of the intestine is to be associated with the herbivorous habit of the ostrich, the intestine being always longer in vegetable feeding animals as compared with flesh eaters, the digestive processes being more prolonged in the former than in the latter. All the parts of the intestine are bound to one another and suspended from the dorsal body-wall by an extremely thin transparent membrane, the mesentery, which receives different names in different parts and is traversed by the arteries and veins going to and from the intestine. Like the gizzard the front portion of the intestine is also attached to the ventral body-wall.

The intestine is divided into two distinct parts, known as the small and the large intestine, the line of junction between them being marked by the presence of two long blind outgrowths, called the cæca. The first or small intestine may be further divided into the duodenum, jejunum, and ileum and the large intestine into the colon and rectum. In the freshly opened bird the walls of the small intestine are usually light or reddish coloured, while those of the large intestine appear nearly black, owing to the nature of the contents. Tape-worms may occur attached to the internal lining of almost any part of the intestine.

The Small Intestine.

The *duodenum* or first part of the small intestine (Fig. 1) commences at the inner dorsal border of the gizzard, and has two limbs, descending and ascending, running nearly parallel and partly embracing the lower border of the stomach. It is swollen at its origin where it receives the bile-duct from the liver. Between the two limbs lies the long, narrow pancreas, its single duct opening into the ascending or distal limb near its upper end. When slit open its mucous lining, as also that of the small intestine generally, is seen to be covered with villi nearly half an inch long in the adult, and serving to absorb the digested food. The duodenum is continued into the rest of the small intestine, the first part of which, following the usual terminology, may be called the jejunum and the remainder the ileum, though there are no characteristics delimiting these.

The Yolk-sac or Yolk-stomach.

In very young chicks not more than about a fortnight old, the yolk-sac or yolk-stomach may still be found with more or less of the nutritive yolk yet unused. It is attached by a short tube to the small intestine some distance beyond the duodenum. Prior to hatching, the yolk-sac is outside the body of the chick, suspended by the umbilical or navel cord, but a day or two before hatching it slips into the body through the navel opening. At first as a thin-walled yellow sac, nearly the size of one's fist, it occupies considerable space in the body-cavity, and is well supplied with blood-vessels. The chick largely lives upon the yolk during the first few days after hatching, but is is wholly absorbed within two or three weeks. From its origin and nature the yolk-sac is to be considered as an integral part of the alimentary canal of the early chick.

Cæca.

At the termination of the small intestine, where it joins on to the large intestine, are given off two long, tapering tubes, ending blindly, and hence known as the cæca. They pass backwards along each side of the terminal part of the small intestine and close to it. Their walls are very thin, and a shallow groove on the outside corresponds with a spiral fold of the wall inside, its surface serving to increase the effective digestive area of the cæca. The food contents are largely liquid and dark coloured. Within the cæca are often to be found numbers of a second species of strongyle, larger than the *Strongylus douglassii* found in the proventriculus, and apparently not so serious in its effect on digestion. In the human intestine only a single vestigial

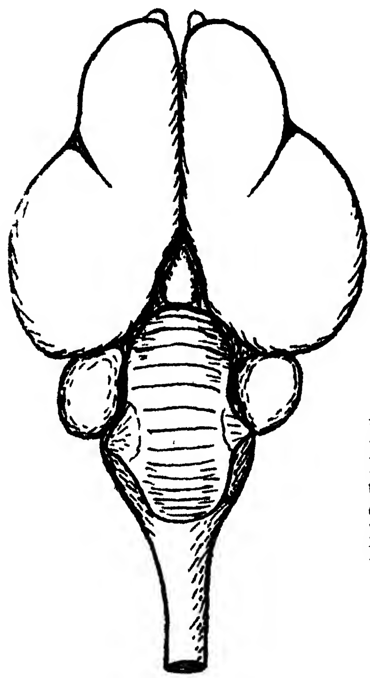


FIG. 5.

The Brain.

Above are the two cerebral hemispheres with the small olfactory lobes just showing. Next is the cerebellum with an optic lobe on each side. Behind is the *medulla oblongata* passing into the spinal cord, severed from the rest of the cord In the angle between the two cerebral hemispheres and the cerebellum is the rather large pineal body.

cæcum occurs, at the end of which is the much maligned *appendix vermiformis*, which represents the tapering end of the cæcum in the ostrich.

The Large Intestine.

The *large intestine* is, like the two cæca, distinguished by having internally a spiral fold along its internal wall, corresponding with a shallow spiral groove on the outside. The fold gradually becomes narrower, and wholly disappears some distance before the termination of the intestine. Absorption of the liquid part of the food takes place in the large intestine, and the undigested contents of the alimentary canal, now termed fæces, gradually become drier and more pebbly in individuals inclined to constipation. The terminal part of the intestine, known as the rectum, opens into the uppermost chamber of the cloaca by a rounded aperture provided with a sphincter muscle (Fig. 1).

The Cloaca.

Birds differ from mammals in having a common chamber into which the food canal, kidneys, and reproductive organs pour their waste matters or products before they are passed out of the body (Fig. 1). This chamber is known as the cloaca, and it opens to the exterior by a single crescentic opening, the vent, with thick, tumid lips, just under the tail. Hence the ostrich has but a single opening behind, through which the fæces, urine, and genital products pass, instead of a separate aperture for the dung and one for the urine and reproductive products as in mammals.

The cloaca is a large, swollen sac, with thick, highly distensible walls, situated at the extreme end of the body, and appearing as the enlarged termination of the intestine. As shown in the figure, it is partly sub-divided into three chambers: an upper (coprodæum) into which the rectum opens, a middle (urodæum) which receives the terminations of the ureters and the genital ducts, and an outer proctodæum into which the *Bursa fabricii* opens. The last chamber communicates with the exterior by the thick swollen lips, crescentic in form when the aperture is closed.

During micturition and defæcation, which are separate acts in the ostrich, the red cloacal walls are partly everted, and are afterwards drawn back by strong muscles passing from the cloaca to the body-wall.

In the male the ventral wall of the cloaca is greatly thickened to form the large conical copulatory organ, the penis, the ostrich being one of the few birds provided with such an organ. It is strongly muscular, and also contains erectile tissue, and is deeply grooved on its upper surface. The groove connects with the openings of the *vaxa deferentia*, and serves to convey the sperm in copulation. It is also protruded and turned downwards and forwards during defæcation.

The Liver.

The *liver* (Fig. 1) is originally formed as an outgrowth of the food canal, and is, therefore, an essential part of the digestive system, its secretion, the bile, being poured upon the food immediately it passes from the stomach. In comparison with its relative size in other birds, the organ is somewhat small in the ostrich, its secretion evidently being of less importance. It is incompletely divided into two lobes, right and left, and the left lobe is smaller than the right and further sub-divided, having a small lobe on its lower outer border. A thick median membrane, the suspensory or falciform ligament, extends along the length of the liver as far as the gizzard, and connects it with the body-wall. This, joining with a transverse membrane, the right and left coronary ligament forms a separate chamber for each half of the liver. Dorsally and laterally the liver lies against the oblique ligament, and in front; where the two halves are widely separated, they embrace the heart. Behind, the liver lies against the stomach.

The liver in a healthy bird is a deep, rich, brownish red, sometimes with a bluish tinge. It is smooth, hard and firm in consistency, cutting with a clean edge. Small quantities of the bright green gall are sometimes seen, but no gall-bladder occurs, hence the secretion must pass down the bile duct as formed, instead of being stored in a gall-bladder and poured upon the food at intervals. The bile duct emerges from the right lobe and passes as a straight tube to open into the duodenum just as it leaves the gizzard.

When hatched, and for a week or two afterwards, the liver of ostrich chicks is of a brown, yellow colour, from the small quantity of blood circulating within it. At one time this was thought to be the symptom of disease, hence termed "yellow liver". It is now known, however, that the colour of the liver has little or nothing to do with this early and usually fatal disease of chicks, now termed "chick fever". The small amount of blood in the chick liver merely indicates a non-active or feebly active condition of the liver for the first two or three weeks. As the liver circulation is better established, and its secretory activity assumed, the yellow colour becomes gradually replaced by the ordinary reddish brown, the change taking place in patches, thereby giving a mottled appearance to the organ for a time. Some chicks may, however, show the reddish colour on hatching, indicating an earlier activity of the liver.

The Pancreas.

The *pancreas* (Fig. 1), corresponding with the sweet-bread in cattle, is a firm, lobed, elongated gland lying in the duodenal loop or first part of the small intestine. Like the liver, it is formed as an outgrowth of the alimentary canal, and hence is a part of the digestive system. It is readily seen between the two loops of the duodenum as a pale, yellowish organ on first opening the body, the upper part broad and the lower narrow and tapering. The single pancreatic duct which conveys the pancreatic juice to the intestine comes off a little above the middle of the organ, and opens into the distal limb of the duodenum near its upper end.

The Spleen or Milt.

The *spleen* is an independent organ, unconnected with any of the systems, but on account of its close situation to the stomach may well be included here. It is elongated and nearly cylindrical in form, and lies attached by mesentery to the upper dorsal outer side of the glandular stomach. In colour it is a very dark, brownish red, and firm in its consistency. According to Dr. Robertson the spleen in miltziekte becomes very soft, semifluid in fact, and the colour of tar. Robertson has found miltziekte much more common in ostriches than is generally supposed and for its treatment employs with much success the anthrax vaccine issued by the Veterinary Laboratory.

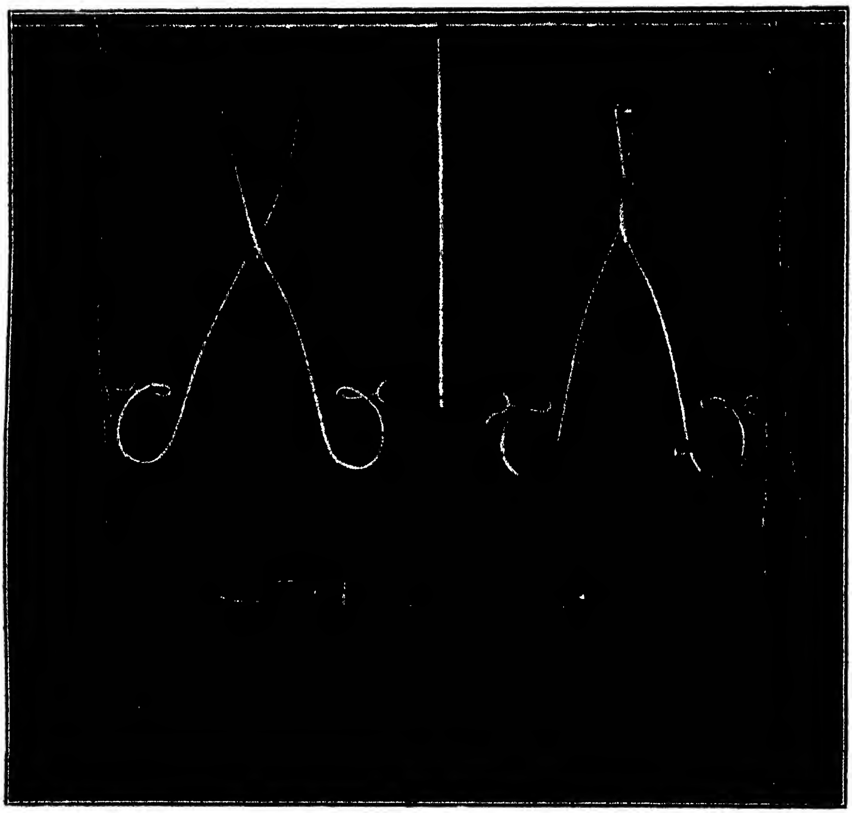
(To be continued.)

Caponising.

By R. Bourlay, Poultry Expert, Potchefstroom Experimental Farm.

Caponising is not a difficult operation, for all that is required is a set of instruments which can be procured from any of the poultry appliance dealers or surgical instrument makers. The set usually consists of a lancet, spreaders, and extractors, though some makers

Pricker.



Set of Caponising Instruments.
Extractors. Spreaders.
Lancet.
Cords with hooks at each end used for holding the bird still during the operation, shown at either end of illustration.

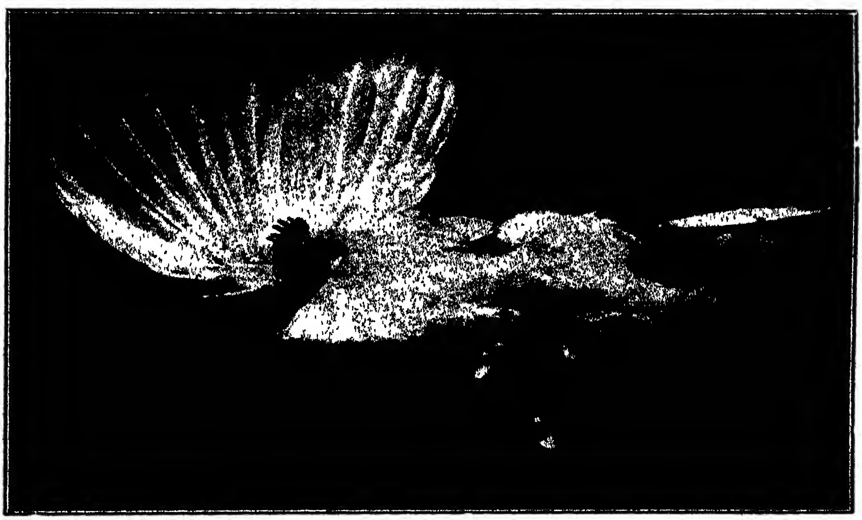
also supply a picker and strings with hooks for fastening the birds, but these latter can be made at home without much trouble.

The age at which cockerels should be caponised is from two to four months, in the case of light breeds, such as Anconas, Leghorns,

etc., two to two and a half months is best, whereas heavier varieties may safely be left until they are three or even four months of age; the reason for this variation being that some of the light breeds develop so much more rapidly than do heavier varieties, and if left too long considerable risk may attend the operation, for, especially in the case of Anconas, I have seen cockerels of three months of age with testicles so developed that they could not be entirely gripped with the extractors, thus necessitating their removal in sections which is seldom satisfactory.

Before operating it is necessary to starve the birds well in order that the stomach shall be empty, twenty-four to thirty-six hours is sufficient, and for the last four or five hours water should be withheld; if this is not done the stomach, being full, obscures vision and makes the operation much more difficult.

The question may arise as to what benefit is derived from caponising light breeds; the answer is that whereas cockerels are quite good for table purposes up to five or six months of age, after that period the flesh is coarse and stringy and not very plentiful, but if the same



Showing method of tying the bird down, also the incision with the spreaders in position.

birds are caponised and kept until they are eight months of age the flesh is tender and juicy and far more abundant; in other words, a capon of a light breed at eight or nine months of age is infinitely preferable to a cockerel of the same breed at five or six months of age.

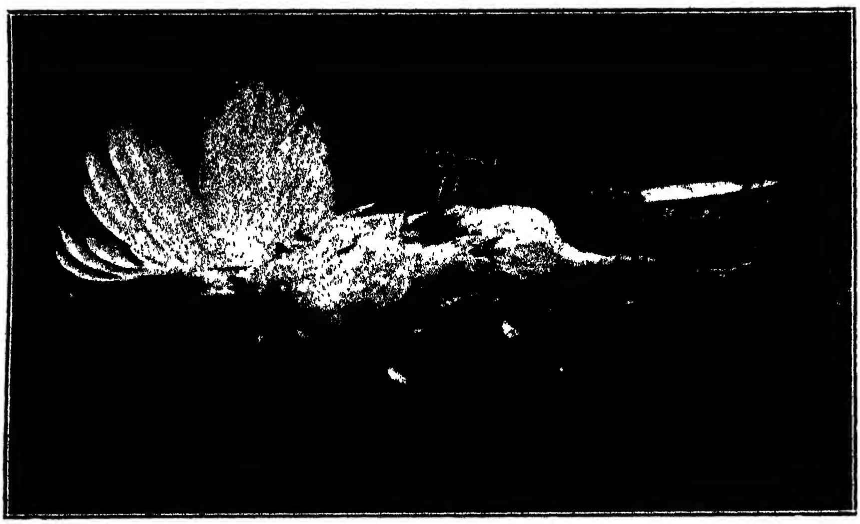
A bright sunny day should be selected, and it is easier to operate in the morning or early afternoon when the sun is giving a slanting light than at midday when it is overhead.

As an operating table, a box with a clean smooth surface serves the purpose excellently; it should stand about three feet high so that the operator does not have to bend too much.

If the cords with hooks are not supplied with the instruments, take two pieces of strong soft string about 18 inches to 2 feet long, make a running noose at one end of each and attach weights at the

opposite ends, one noose is then slipped over the two legs and tightened above the hocks and the weight allowed to hang down over the side of the box or table, the other noose is then slipped over the wings and the weight is allowed to hang down over the opposite side of the box to where the leg weight hangs; the bird is thus held in such a position that it cannot move its body, though the head is quite free.

A basin of water containing disinfectant must be at hand also a clean rag. When the bird is securely tied a few of the feathers should be gently plucked from the side, just forward of the thigh, but it is only necessary to remove those which cover the back ribs, then with the rag, which has been first soaked in the disinfectant, wash the skin and also wet any feathers which are likely to lie in such a position as to interrupt operations, when these are wet they can be smoothed out of the way and will stay so; when this has been done the skin covering the hind ribs is bare and the operator must



Showing method of tying the bird down, also the incision with the spreaders in position.

feel for the last or back rib and with the lancet make an incision between the two hind ribs, cutting downwards towards the lower end, the spreaders are then put in place, the small hooks each gripping a rib and holding them apart. A fine skin or membrane is then visible, which must be either cut with the point of the lancet or opened with the pricker, and when this is done the stomach is visible and one testicle can be clearly seen lying close to the backbone; in shape it is somewhat similar to a bean and is of a creamy colour, but the size naturally varies considerably according to the age and breed. When the organ has been located the extractors are inserted open, and the testicle allowed to slip through the loop half, after which the extractors are closed, thus gripping the ligature attaching it to the body, a couple of twists are given to the instrument, which can then be carefully withdrawn bringing the organ with it. If by accident it is dropped it must be recovered with the extractors or the consequences may be serious.

When the one organ has been removed the bird should be turned over and the same process repeated on the other side.

It is possible to remove both organs from the one side, but as a rule this takes longer than opening both sides, for a membrane separates the two testicles, which has to be opened before the second can be reached, and especially in the case of older birds there is a certain risk of rupturing the artery which lies in the vicinity.

There is no necessity to sew up the wounds, but the bird should be gently liberated and placed in a roomy house, the floor of which must be well littered with straw or dried grass, but on no account should it be allowed to perch. Feed immediately on soft food, which should be continued for three or four days. Within a week the wounds will be healed and the bird may then be placed in its usual quarters.

It is wise for a beginner to practice on a dead bird, so that unnecessary pain may be obviated, and he can then take his time and learn exactly where to cut and where to look for the organs.

While operating, all instruments when not in use should be kept in disinfectant, and when finished with should be thoroughly sterilized by boiling in water before being cleaned, dried, and put away.

Some people prefer to operate with the bird's back towards them, whilst others prefer the breast towards them, but this is purely a matter of use, though whichever method is adopted the spreaders should be placed with the handles away from the operator, or they are apt to be in the way.

There is a lot of difference in the various breeds, some being much easier to caponise than others; light breeds are much easier subjects than heavy varieties, whilst the most troublesome breed that we have experimented upon is the Indian Game, partly due to the amount of flesh covering the ribs and also to its great depth of body.

I am indebted to Mr. T. O. Bell for taking the accompanying photographs.

The Co-operative Selling of Grapes.

Paper read at the Paarl on the 26th of September, 1911, by
Dr. A. I. Perold, Government Viticulturist.

Many a one will perhaps smile on reading the above title, seeing that so many co-operative enterprises have met with failure. Were I asked why they failed I should give the following causes:—

(*a*) Because practically only Government money was used and very seldom private money;

(*b*) because (as regards expenditure incurred) naturally the enterprise was started on too great a scale; and

(*c*) last but not least, because of *lack of the co-operative spirit on the part of the co-operators.*

A true spirit of co-operation is therefore essential to success; and, further, the beginning should be small and development gradual. In this way co-operation is of an experimental nature, and experience is gained without our running the risk of having to pay heavily for it. Moreover, if we wish our efforts to meet with success we should not extend the enterprise until our own experience has taught us what to do and how to do it, always keeping before our minds the old adage: *Festina lente,* i.e. hasten slowly. We should be particularly careful to keep expenditure as low as possible; and, further, it is of the utmost importance to work exclusively *with the money of the co-operators themselves,* the safety and the ultimate success of co-operative enterprises depending in a great degree upon this policy.

That successful co-operation is possible along these lines has been proved by the Dried Fruit Co. at Wellington.

But enough of this. I do not intend expounding upon the advantages of co-operation generally. My object is merely to discuss the question as to the extent to which successful co-operative selling of table-grapes is possible in our country.

I have been induced to write this article after reading an article in the *Revue de Viticulture* of 26th January, 1911, by Professors Zacharewics and Jean on "An Experiment in the Co-operative Selling of Table-grapes; the Co-operative Society of Cabrières d'Aigues (Vaucluse)".

It would take too much time for me to translate the whole article and I shall therefore only give my readers the principal facts in connection with this co-operative enterprise, in order that we may benefit thereby in case a similar movement may eventually be set afoot here.

In the town of Cabrières d'Aigues there are many small landowners who grow table-grapes. Late varieties are chiefly grown. In the past the grapes were all sold to fruit-buyers. But there were many drawbacks to this practice. Thus, it was sometimes difficult to

fix the price of grapes; then, again, the grower was often obliged to keep his grapes on the vines for such a long time that many ran to waste. Now, early in 1909 the idea occurred to people there of creating better commercial conditions by the adoption of co-operative principles. A beginning was made with only forty co-operators, the largest owners of whom did not represent more than three-quarters of a morgen of vineyards of table-grapes, several only supplying from 440 to 660 lb. of table-grapes. The initial outlay was only £58, which was afterwards increased to £80. This capital has been paid up fully in £1 shares, and anybody (at least, any vineyard owner) could take shares. One of the articles of the association stipulates that every *shareholder must supply all his table-grapes to the Co-operative Society.* The shareholders receive 4 per cent. interest per annum on the capital value of their paid-up shares.

The first year, i.e. 1909, a man was obtained to do the packing of the grapes. A building was hired for the sum of £6 for the export season, which is generally from 25th October to 15th November.

The Servan, a white late variety and very good for exporting, is chiefly exported.

In 1909 77,000 lb. of grapes were shipped to Paris, Lille, Marseilles, Geneva, Cologne, etc.

After deduction of expenses 6s. 2d. was paid out per 100 lb. of grapes. Had it not been for the fact that a consignment of 11,000 lb. of grapes to Cologne had rotted through the fault of the railway authorities a greater sum would have been paid out. The immediate result of the establishment of this co-operative concern was that the grape-buyers now suddenly offered higher prices to those who had not joined, with a view to keeping them out of the society. And yet they did not on an average pay more than the society itself.

In 1910 a building 32 ft. 9 in. wide and 52 ft. 6 in. long was erected as a storeroom at a suitable spot in the town. This building cost £200. The sum was obtained as a Government loan for fifteen years at 2 per cent. interest. The shareholders are jointly responsible for this sum. When the grape season is not on this building is used by an agricultural syndicate at £2 rent per annum.

As was the case almost everywhere in Europe, the grape crop for 1910 was very poor there, so that not more than 55,000 lb. of grapes were exported to Cologne and Geneva. After deduction of all the expenses the society paid out 14s. 6d. per 100 lb. of grapes, whilst the buyers in the neighbourhood did not give more than 11s. 7d. per 100 lb.

It is therefore evident how great the profit was which the members of the co-operative society obtained after its having existed only two years.

How does the society work? Quite simply. The secretary, who it at the same time manager, receives payment for the days he has to leave his own work in order to work for the society. The president helps the secretary by giving him advice. He is a clever business man and has also succeeded in imparting a sound business spirit to the society.

Every night the committee fixes the amount of grapes to be cut by the several shareholders for the following day. The grapes are weighed as soon as they have been brought into the storeroom, and the owner gets a receipt for his grapes. At the same time the grapes are valued and divided into two classes according to their qualities,

Upon payment, 1s. 8d. per 100 lb. less is paid out for those of the second class than for those of the first class. So that it is a matter of importance for the producers to keep their grapes as sound as possible. If so desired, a certain sum, which has been fixed beforehand, is paid out immediately or after a few days to any shareholder for grapes supplied, according to the expected selling price. Thus in 1909 the sum of 4s. 6d. per 100 lb. of grapes was fixed; in 1910 8s. per 100 lb. The rest is paid out as soon as all the grapes have been sold and the money paid in.

The calculation is thus based upon the sum which can be paid per 100 lb. of grapes (after deduction of all expenses) and upon the sum to be received by the several shareholders.

The grapes are sent in well ventilated boxes, 22 lb. in weight. They contain on an average 20 lb. of grapes. These empty boxes are purchased for the sum of 16s. to 18s. per 100. They weigh fully 2 lb. each.

Packing.—A thin layer of woodwool is placed at the bottom of the boxes. On the top of this and along the sides of the box a kind of parchment-paper is laid. Between the several layers of grapes double layers of white paper are placed with the name of the society upon it. The upper layer is covered with parchment-paper. The cover is fastened with a piece of cord. Every box bears the mark and name of the society. At Cologne the grapes of this society were much in demand, not only on account of their high quality but also by reason of the splendid condition in which they arrived; they were preferred to many other grapes.

In the great cities where the grapes are sent the society has commission agents who sell them.

This is what has been done at Cabrières d'Aigues. What shall we do?

In our country there are many farms where such a co-operative society could be established with success. Take for instance the vineyards situated along Paarl Berg. Up to 30,000 baskets of table-grapes are annually sold here. There would therefore be no lack of grapes. With a strong co-operative society managing all the grapes much advantage could then undoubtedly be gained. At present everybody sells his grapes as best he can. It is true that a minimum price is fixed for the beginning of the season, but afterwards many growers do not keep to the agreement, until in the end one tries to supply his grapes cheaper than the other. This eager competition amongst growers would cease naturally with a strong co-operative society. But this is not all. The drawback in our country with its small population is the easy over-supplying of our markets. This must be prevented as much as possible. A strong co-operative society with strong representatives in our large cities can assist a great deal in remedying matters.

Although our local markets have to be taken into consideration first as regards our table-grapes we have nevertheless good prospects of increasing our export trade in this way. With proper agents at London, Hamburg, Antwerp, Rotterdam, and New York we ought to be able to send large quantities of grapes to these places with good financial results. It is clear that a strong co-operative society with *able managers* would carry on such an export trade in an economical way and with good prospects of success. *But we must begin in a small way.*

It is evidently not necessary to go into the particulars as regards the inner working of such a society; each society could be regulated as desired. It would, however, be necessary to adhere to a few principles, e.g.:—

(1) That every member must supply all his table-grapes to the society.

(2) That the grapes must be divided in two classes, the second class to be worth, say, 2s. per 100 lb. less than the first class.

(3) That the manager must be a capable man, with a good character, one who has been a successful trader in table-grapes here for many years; his salary should be paid out of the yearly sales at a certain percentage.

(4) That the grapes be packed neatly in boxes to be sold along with the contents.

(5) That the manager fix both the amount and the kind of grapes to be brought the following day by every member.

(6) That reliable commission agents be appointed in the most important commercial centres as well as abroad.

(7) That the society work only with money of the members themselves, and for this purpose issue £1 shares, to be called upon at any time according to circumstances.

(8) That payment in part for grapes supplied be made as soon as possible.

These are to my mind the requisites for ultimate success for such a co-operative society. That success is possible along these lines has been proved by the small co-operative society at Cabrières d'Aigues during its short period of existence.

This might savour of too much compulsion. Without compulsion, however, nothing lasting can be accomplished. If the *hoops* did not *force* the staves of a barrel to stay together (that is, if the hoops were removed) the staves would soon fall asunder and the barrel would cease to exist. It is the same with co-operation. And if the French and other nations are satisfied with so much compulsion shall we then be so obstinate and narrow-minded as not to impose upon ourselves the necessary compulsion which would lead to ultimate success? No, I cannot believe this of our people. The objection against compulsion will surely soon disappear. As to the manager I am positively sure that we possess men suitable for such a situation.

The difficulties in connection with such a co-operative society as I propose are not to be compared with those of co-operative wine-making, creameries, etc., much capital being needed in these cases for casks, machinery, etc., all of which are not necessary here. And, further, one does not have to wait long for his money.

I therefore think it would be a good thing if this matter were to be discussed by parties interested, in order to have established as soon as possible one or more strong co-operative societies for the selling of table-grapes.

The present trade in grapes must be improved upon. Those interested in this business are not always the right people. And for this very reason I think the time has arrived for our grape-producers to stand shoulder to shoulder in order to obtain, not only better prices but sounder trade conditions.

I have now set the ball rolling, and trust that more able persons than myself will take up the cudgels on behalf of this good cause, in order that we, too, may reap the benefits of true co-operation.

The Composition of Cape Barley.

By Dr. C. F. Juritz, Chief Chemist.

Early in 1909, when the Cape Wine, Beer, Spirits, and Vinegar Act, 1908, was brought into operation, firms interested in the brewing of beer represented to the late Cape Government that the provisions of the Act directed against the use of sugar in beer would result in their being obliged to import barley for brewing purposes instead of employing Cape-grown barley (which was mostly of second grade quality) as had been the practice previously.

The reason given for this change of practice was that "sugar is used in brewing chiefly with the object of reducing the percentage of nitrogenous or albuminous matter which is extracted from the malt in the process of mashing". "The inferior grade of barley grown at the Cape", it was further stated, "contains a type of nitrogenous matter detrimental to the brewing of sound beers", and "its influence can only be neutralized by the use of sugar as an adjunct to reduce the percentage to a point at which it is all, or nearly all, assimilated by the yeast during fermentation".

It was deemed desirable to investigate, as far as could be done, the validity of the reasons put forward on behalf of Cape brewers, and so six samples of Cape-grown barley were analysed in the Capetown Laboratory by Dr. Lewis during February, 1909. These samples were described as follows:—

1. Barry Bros., Robertson.
2. Cape six-rowed barley, Robertson.
3. Webb's beardless barley, Robertson Experiment Station.
4. New Burton malting barley, Robertson Experiment Station.
5. Rabie—Barry Bros., Montagu.
6. Rabie—Barry Bros., Worcester.

The analyses of these barleys, some of which it will be noticed were grown from Colonial and others from imported seed, were as follows:—

No.	Moisture.	Fat.	Nitrogen.	Fibre.	Ash.
	%	%	%	%	%
1................	8·13	1·70	1·44	5·98	2·32
2................	9·71	1·82	1·12	6·63	2·82
3................	9·01	2·02	1·29	5·22	2·59
4................	9·10	1·50	1·39	4·51	2·57
5................	10·46	1·80	1·28	6·90	2·30
6................	10·11	1·75	1·21	5·49	2·28

The nitrogen percentages indicated by these results are well below the averages of foreign brewing barleys. They range, it will be seen, from 1.12—a Cape six-rowed barley being the lowest—to 1.44, and if a low proportion of nitrogen characterizes a good brewing barley, these samples, as Dr. Lewis reported at the time, were excellent.

Nevertheless, as noted above, it has been held that the *nature* rather than the *amount* of nitrogenous constituents in a barley influences its adaptability for brewing. Apart from this, however, the opinion has been freely expressed that the *quantity* of nitrogen in Cape barleys is, as a rule, so high as to render them unsuited for brewing purposes.

The next step was taken about the middle of 1910. Six samples of barley grown in the Robertson Division, Cape Province, were examined, three of these (Nos. 7 to 9) being grown from imported seed, and three (Nos. 10 to 12) from Colonial seed. Besides being submitted for analysis in the Laboratory under my control, duplicates were sent to Dr. Horace Brown, F.R.S., and portions were also submitted to a well-known firm of high repute in England connected with the brewing trade. This firm, in due course, forwarded its opinion on the barleys. "The very high nitrogen percentage", so the expression of opinion ran, "would render them quite unsuitable for malting", and it is of interest to note that this opinion was expressed specifically with regard to the three two-rowed barleys, Nos. 7, 8, and 9, which had been grown from imported seed. The above firm's own analyses showed these three samples to contain from 1.91 to 1.96 per cent. of nitrogen.* On the other hand, the three six-rowed barleys (Nos. 10, 11, and 12) grown by Barry Bros., Robertson, from Cape seed, the same firm pronounced to be "much more promising". One of these (No. 11) had, according to the English analysis, a rather high percentage of nitrogen, viz., 1.72, but in one case (No. 10) declared to be "certainly the best of the lot", the nitrogen was represented as "quite normal" in amount, namely, 1.50 per cent. The further opinion was expressed that "this sample has practically the same analysis as a good Californian brewing, and if any large quantity could be grown of the same quality should be able to compete with Californian brewing on equal terms". The latter sentence shows that in the opinion of the firm consulted the advantage of a low nitrogen percentage possessed by these three Robertson barleys is not more than counterpoised by the *nature* of the nitrogenous compounds being such as to render the barley of doubtful quality. The view was also expressed that the district was much more suitable for six-rowed than for two-rowed barleys, and that the former would probably pay the farmer very well. By Dr. Brown also the view was expressed that two-rowed barleys of the Chevalier and Goldthorpe types, although in some cases fine barleys to look at, tended in the Cape climate to become too highly nitrogenous for brewing requirements.

After these remarks, the figures resulting from the analyses of

* The nitrogen percentages in these three or four lines are calculated upon the dried barley, the figures yielded by calculating on the undried grain are shown below in tabular form.

the portions of Nos. 7 to 12 retained in the Capetown Laboratory will be all the greater in interest. They were as follows:—

No.	Moisture.	Nitrogen.
	%	%
7.........	11·10	1·66
8.........	12·19	1·66
9.........	11·68	1·68
10.........	11·28	1·43
11.........	9·98	1·45
12.........	9·64	1·31

The results of the analyses made in England were as follows, calculated as in the above tables on the *undried* grain:—

No.	Moisture.	Nitrogen.
	%	%
7.........	11·7	1·70
8.........	12·0	1·68
9.........	11·8	1·72
10.........	12·1	1·38
11.........	11·6	1·52
12.........	11·7	1·32

As already stated, Nos. 7 to 10 were grown from two-rowed imported seed, while Nos. 10 to 12 were Cape six-rowed barley from Barry Bros., Robertson. The first three are more completely described below:—

7. Webb's New Burton malting barley.
8. Webb's Chevalier barley.
9. Webb's beardless barley.

The English analyses therefore showed the two-rowed barleys to average 1.70 per cent. and the Cape barleys 1.41 per cent. of nitrogen. According to the Capetown analyses the averages were respectively 1.67 per cent. and 1.40 per cent., so that both sets of results showed that, as regards their nitrogen percentage, the Cape barley was better suited for brewing than the barley grown from the imported seed.

There were still various other points left open for investigation, and endeavours were made to arrive at some definite conclusions regarding at least one of these points, as well as to undertake initial steps with regard to the second, during 1911. The former point for investigation was to gain a general knowledge of the composition of malting barleys grown in various districts of the Cape Province, the other was to ascertain in how far the Cape climate was likely to influence the composition of two-rowed imported barley through successive generations of crops. During the course of the following pages each of these two topics will be dealt with separately.

During the opening weeks of 1911 I wrote to the Civil Commissioners of Malmesbury, Stellenbosch, Caledon, Paarl, Tulbagh, Worcester, Robertson, Cathcart, and Alexandria—these divisions

having been suggested by Mr. R. W. Thornton, Government Agriculturist—asking these officers to furnish me with representative samples of Cape barley grown in their respective divisions, taken from centres widely separated from each other, and having regard to the varying conditions obtaining in different parts of each division. I also requested each Civil Commissioner to state, with respect to each sample submitted by him, the names of the producer and of the farm and field cornetcy in which the sample was grown, as well as answers to the following questions:—

(*a*) What is the nature of the soil?

(*b*) What fertilizers were used? In what quantity?

(*c*) How was the land treated? Was the sample from first, second, or third crop?

(*d*) What proportion of seed was used?

(*e*) What kind of seed was used?

(*f*) How many 150-lb. bags of barley per morgen resulted?

The following is a list of the samples submitted in response to the above request: the information tabulated is compiled from that supplied by the farmers, and it must be said that in some cases the Civil Commissioners added an expression of doubt as to the absolute correctness of the information so supplied:—

No.	Producer.	Field Cornetcy.	Farm.	Nature of Soil.	Fertilizer per Morgen.	No. of Crop.	Treatment of Land.	Seed Used.		Yield per Morgen.	
								Kind.	Quantity per morgen.	Grain.	Straw.
					I.—Malmesbury Division.						
13	P. J. du Toit....	Saldanha Bay	Klipfontein..	Sandy, mixed with limestone, high stony veld	None used	1st	Previous year's crop grown without manure. After wheat crop nothing done to soil until barley was ploughed in	Ordinary Cape	37½ lb.	1800 lb.	About 4000 lb. (2 wagon loads).
14	C. M. Neethling..	Zout Rivier..	Matjesfontein	Mixed clay and sand	About 6 wagon loads of sheep manure	,,	Ploughed five months before sowing; seed sown in April	,,	1½ bushel	Unknown	About 4 wagon loads.
15	J. A. Munnik.. .	,,	Schaapplaats	Clay (zwartland)	,, ,,	,,	Ploughed in August and reploughed in May, when seed was sown	,,	60 lb.	About 3000 lb.	4 wagon loads.
16	J. Steyn.........	Mossel Bank Rivier	Wolvedans...	Clay......	Farmyard manure	,,	—	,,	40 lb.	2250 lb.	2 wagon loads.
17	P. J. Jordaan ..	,,	Elands Vlei..	Vlei	,,	,,	—	,,	,,	1800 lb.	1½ wagon loads.
18	G. P. C. Loubser..	,,	Blauw Blommetjes Kloof	Clay.	,,	,,	—	,,	,,	2400 lb.	2 wagon loads.
19	G. P. C. de Kock.	,,	Leeuwendans	,,	,,	,,	—	,,	,,	2250 lb.	,,
20	J. F. van Reenen	,,	Vogelstruisfontein	—	,,	,,	—	,,	,,	1500 lb.	1½ wagon loads.
21	J. F. Dreyer....	,,	Leeuwenkuil	Clay	,,	,,	—	,,	,,	2250 lb.	1¼ wagon loads.
22	E. Smith........	,,	Drooge Vlei .	Vlei..	,,	,,	—	,,	,,	1875 lb.	1 wagon load.
23	B. de V. Smuts...	Honingberg..	Klipfontein.	Clay.	Stable manure	,,	—	,,	75 lb.	About 4050 lb.	About 4 wagon loads.
					II.—Caledon Division.						
24	W. Metcalfe.....	Zwart Rivier	Diep Rivier..	Clay and stone	Superphosphate, 300 lb	1st	Land was first burnt and allowed to lie fallow four years; then bracked and ploughed	Cape 6-row	300 lb.	4500 lb.	Unknown.
25	H. C. de Wet...	Lower River, Zonder End	Scheldskloof	Clay	Superphosphate, 325 lb.	,,	First bracked and then ploughed	,,	2½ bushels	3000 lb.	About 3000 lb.
26	J. J. de Villiers..	Caledon.....	Dunghye Park	Clay and stone	Superphosphate and guano, 265 to 330 lb.	,,	Bracked and ploughed....	,,	,,	3300 lb.	Unknown.

No.	Producer.	Field Cornetcy.	Farm.	Nature of Soil.	Fertilizer per Morgen.	No of Crop.	Treatment of Land.	Seed Used. Kind.	Seed Used. Quantity per morgen.	Yield per Morgen. Grain.	Yield per Morgen. Straw.
	II.—Caledon Division (*continued*).										
27	Van deurs Eksteen	Lower River, Zonder End	Maandag Zout Rivier	Clay	Superphosphate and guano, 300 lb.	2nd	Bracked twice and then ploughed	Cape 6-row	75 lb.	2250 lb.	4 wagon loads.
28	W. L. Fick.. . .	Caledon.....	Weltevreden	.. ..	Guano, 400 lb	1st	Bracked and ploughed . .	..	300 lb.	4500 lb.	About 6000 lb.
29	P. H. Zwart.....	Zwart Rivier	Zwart River	Clay and stone	Superphosphate, 300 lb	..	,, ...	,,	75 lb.	3150 lb	5 wagon loads.
	III.—Paarl Division.										
30	Mrs. A. M. F. Pauling	Dal Josaphat	Diemersfontein	Vlei	Government guano	—	Ploughed and harrowed...	Late barley	50 lb.	750 lb.	1 good load.
31	J. H. Buxmann..	Groenberg..	Burgers Drift	Clay	Government guano and kraal manure	1st	Bracked, ploughed, cultivated and harrowed	Late old barley	75 lb	1500 lb.	About 7000 lb.
32	J. N. Louw... ..	Hermon....	Eikeboom. ..	Mixed with gravel	Kraal mixture of cattle and sheep	3rd	Well worked...........	White baard	—	50-fold..	—
33	,, ...	,, ...	,, ..	,,	.. ,,	,,	,, ...	Early baard	—	.. ..	—
	IV.—Tulbagh Division.										
34	A. J. du Toit....	Winterhoek..	Klipfontein.	Clay........	130 lb. Guano and 130 lb. superphosphate	1st	First bracked and then ploughed and harrowed	Colonial late barley	100 lb.	About 4500 lb.	About 3 wagon loads.
35	Sir Meiring Beck..	,,	Drostdy.....	Gravel clay..	130 lb. Guano and 200 lb. basic slag	,,	.. ..	Colonial	100 lb.	—	About 2½ wagon loads.
36	P. J. Redelinghuys	Waterfalls...	Goedgevonden	Clay........	Guano, 300 lb.	,	Twice ploughed and a third time for sowing	,,	100 lb.	3300 lb.	2½ wagon loads.
37	P. Conradie.....	Breede River	New Munster	,, ...	Cattle manure, 80 bags	2nd	Ploughed and sowed......	Colonial and imported	100 lb.	Colonial, 3300 lb.; imported less	—

No.	Producer.	Field Cornetcy.	Farm.	Nature of Soil.	Fertilizer per morgen.	No. of Crop	Treatment of Land.	Seed Used. Kind.	Seed Used. Quantity per morgen.	Yield per Morgen. Grain.	Yield per Morgen. Straw.
	IV.—Tulbagh Division—(continued).										
38	Imperial Cold Storage	Koopmans River	Bonne Esperance	Sandy ground	Stable and sheep manure mixed	—	Bracked, ploughed, and harrowed	Imported	—	—	—
39	J. J. de Klerck	"	Schoongezicht	Karroo	Kraal manure	—	" "	"	—	—	—
	V.—Worcester Division.										
40	D. Meiring.......	Worcester....	Uitvlugt.. .	Sandy....	Very small portion sown with Government guano	2nd	Usual ploughing, about 7 inches deep	Colonial barley	150 lb.	About 4500 lb.	—
41	"	" ...	" ..	Karroo clay	—	—	—	—	—	—	—
42	J. J. Theron.. ..	Voorste Bosjesveld	Mimosa......	Sandy	None.........	—	Watered once before ploughing and once after sowing	Colonial	60 lb.	2250 lb.	1¼ loads.
43	D. F. Viljoen....	"	Moordkuil...	Clay and sand: karroo	—	2nd	Watered twice......... ..	Best Colonial	50 lb.	From 7500 to 10,500 lb	Very good quantity.
44	J. C. Rabie......	Over Hex River	Wilge River..	Broken karroo: sand and clay	Farm manure, 3 wagon loads (about 30 bushel baskets to 150 lb. seed)	3rd	Ploughed in single furrow, 6 to 7 inches deep	Horse-threshed	150 lb.	From 9000 to 10,500 lb.	—
45	J. G. Meiring....	Achter Hex River	Meiring's Hoop, De Doorns	Clay..	None...	—	Ground where vines were destroyed	Good Colonial	About 2 bushels	2400 lb.	About 750 lb.
46	G. F. du Toit....	Wagenbooms Rivier	Breede River	"	Government guano, 2 bags	1st	Once ploughed and once well harrowed and rolled	Horse-threshed	150 lb.	About 3000 lb. Very poor. Drought in September and October	Small quantity on account of low growths.

No.	Producer.	Field Cornetcy.	Farm.	Nature of Soil.	Fertilizer per Morgen.	No. of Crop.	Treatment of Land.	Seed Used. Kind.	Seed Used. Quantity per morgen.	Yield per Morgen. Grain.	Yield per Morgen. Straw.
					VI.—Robertson Division.						
47	J. Viljoen.......	Before Cogmans Kloof	Zandvliet....	Vlei...... ..	Nil...	1st	First ploughed, then sown and harrowed	Cape barley	2 bushels	6000 lb.	About 9000 lb.
48	J. le Roux......	Vink Rivier..	Vink Rivier..	Sandy clay..	,, ...	,,	.. ..	..	,,	,,	About 6000 lb.
49	J. Blom.........	Bosjesveld..	Bushman's River	Clay karroo..	Goat manure, 8 wagon loads	,,	.. ..	..	4 bushels	,,	About 5000 lb.
50	W. D. Malherbe..	Middle Bosjesveld	Vrolijkheid...	,,	Goat manure, 6 wagons	,,	.. ..	,,	5 bushels	5250 lb.	..
51	J. S. Bruwer.....	Robertson...	Hoops Rivier	,,	Nil..........	,,	First sown, then ploughed and harrowed	,,	2 bushels	3000 lb.	About 3000 lb.
52	J. Malherbe......	Before Cogmans Kloof	Klaas Voogds Rivier	Pot clay karroo	,, ...	,,	First ploughed, then sown and harrowed	,,	½ bushel	1800 lb.	About 1000 lb.
					VII.—Cathcart Division.						
53	P. E. Brown.....	Ward 3.....	The Dales...	Sandy	Kraal manure, 2 wagon loads	1st	Ploughed and harrowed...	Colonial	180 lb.	2250 lb.	3600 lb.
54	R. C. Hart......	Ward 6.....	Hopewell....	,, ...	Nil..........	3rd	Ploughed twice..........	Smyrna	110 lb.	1350 lb.	—
55	J. C. Miles......	Ward 3.....	Hilton.......	Black pot clay	Cattle manure, 3 wagon loads	1st	Ploughed, harrowed, and irrigated	Cape....	150 lb.	About 1800 lb.	1000 bundles.
56	A. S. Evans. ...	Ward 2.....	Lowestoffe ..	Red sandy soil, rather poor	Nil..........	,,	Ploughed and harrowed..	Bearded Smyrna	25 lb.	750 lb.	{2000 lb. from the 50 lb. used.
57	,, ...	,, ...	,,	,,	,, ...	,,	,, ,,	Cheviot	25 lb.	600 lb.	
58	J. Sharrock......	Ward 6.....	Wanstead ...	Black sand..	,, ...	3rd	—	Colonial	1 bag	7500 lb.	4240 lb.
59	F. Wiggill.......	Ward 4. .	Junction.....	Red sandy soil	,, ...	,,	Cultivated once; ploughed second time to sow	Old Colonial	80 lb.	Approximately 2250 lb.	Approximately 1000 bundles.

The analyses of these forty-seven samples resulted as shown in the following tables, nearly all the analyses having been performed by Mr. S. B. Simons, B.A.:—

I.—Malmesbury Division.

No.	Moisture.	Fat.	Nitrogen.	Fibre.	Ash.	Lime.	Phosphoric Oxide.
	%	%	%	%	%	%	%
13.....	11 ·67	1 ·78	1 ·53	5 ·53	2 ·04	·098	·820
14.....	11 ·40	1 ·59	1 ·46	5 ·58	2 ·18	·068	·690
15.....	12 ·08	1 ·97	1 ·74	5 ·80	2 ·68	·065	·670
16.....	10 ·54	1 ·60	1 ·15	5 ·57	2 ·30	·049	·650
17.....	11 ·21	1 ·77	1 ·46	6 ·46	2 ·50	·077	·652
18.....	10 ·93	1 ·85	1 ·43	6 ·11	2 ·28	·090	·630
19.....	10 ·61	1 ·91	1 ·44	6 ·64	2 ·41	·051	·720
20.....	11 ·39	2 ·07	1 ·01	6 ·75	2 ·34	·040	·560
21.....	10 ·22	1 ·46	1 ·37	5 ·95	2 ·42	·052	·620
22.....	10 ·55	1 ·65	1 ·11	6 ·34	2 ·83	·064	·789
23.....	11 ·08	1 ·71	1 ·58	5 ·56	2 ·60	·042	·434
II.—Caledon Division.							
24.....	11 ·34	2 ·39	1 ·10	6 ·08	2 ·09	·092	·50
25.....	12 ·06	2 ·14	1 ·52	6 ·64	1 ·97	·050	·30
26.....	13 ·43	2 ·18	1 ·24	6 ·58	2 ·03	·052	·46
27.....	12 ·96	2 ·02	1 ·10	6 ·27	1 ·98	·045	·46
28.....	12 ·24	2 ·14	1 ·20	6 ·05	2 ·09	·045	·55
29.....	12 ·09	2 ·33	1 ·24	5 ·90	2 ·04	·051	·41
III.—Paarl Division.							
30.....	11 ·41	2 ·11	1 ·15	6 ·01	2 ·19	·112	·64
31.....	10 ·44	2 ·36	1 ·29	5 ·91	1 ·98	·083	·56
32.....	10 ·80	2 ·36	1 ·13	5 ·59	1 ·97	·126	·55
33.....	11 ·30	2 ·45	1 ·52	6 ·21	2 ·82	·092	·83
IV.—Tulbagh Division.							
34.....	11 ·06	1 ·78	1 ·12	5 ·50	2 ·08	·11	·63
35.....	10 ·91	1 ·99	1 ·10	6 ·06	1 ·89	·09	·55
36.....	10 ·62	1 ·96	1 ·17	6 ·08	1 ·85	·05	·41
37.....	10 ·80	1 ·68	1 ·57	6 ·01	2 ·36	·15	·82
38.....	10 ·72	1 ·83	1 ·49	6 ·57	2 ·18	·11	·46
39.....	11 ·44	1 ·99	1 ·31	6 ·82	2 ·48	·10	·58
V.—Worcester Division.							
40.....	11 ·47	1 ·38	1 ·47	6 ·04	2 ·31	·050	·69
41.....	11 ·72	1 ·48	1 ·17	6 ·92	2 ·85	·070	·87
42.....	10 ·62	1 ·58	1 ·45	6 ·43	2 ·14	·063	·57
43.....	10 ·75	1 ·60	1 ·29	6 ·59	2 ·68	·081	·75
44.....	10 ·54	1 ·78	1 ·20	6 ·68	2 ·69	·069	·82
45.....	10 ·94	1 ·38	1 ·43	6 ·24	2 ·62	·080	·78
46.....	10 ·01	1 ·46	1 ·40	5 ·87	1 ·89	·047	·37

VI.—ROBERTSON DIVISION.

No.	Moisture.	Fat.	Nitrogen.	Fibre.	Ash.	Lime.	Phosphoric Oxide.
	%	%	%	%	%	%	%
47.....	11·86	1·60	1·75	6·29	2·61	·068	·67
48.....	11·10	1·62	1·75	6·10	2·85	·062	·75
49.....	10·21	1·60	1·58	5·94	2·81	·059	·76
50.....	10·59	1·51	1·58	6·31	2·61	·102	·75
51.....	10·52	1·61	1·44	6·13	2·71	·073	·72
52.....	10·09	1·51	1·69	6·72	2·62	·067	·66

VII.—CATHCART DIVISION.

53.....	12·38	2·34	2·01	6·54	2·11	·11	·40
54.....	11·78	2·16	1·73	6·06	1·93	·07	·42
55.....	11·27	2·33	1·26	6·95	4·63*	·17	·79
56.....	11·34	2·32	1·89	6·02	2·03	·10	·55
57.....	12·31	2·53	1·44	4·34	2·82	·11	·86
58.....	12·58	2·42	1·66	5·48	2·07	·12	·42
59.....	11·11	2·23	1·31	6·43	2·98	·21	·70

In the analyses of Nos. 24 to 33, and 53 to 59, the fat determinations were made by extracting the *air-dried* barley with ether in a Soxhlet's apparatus, and not, as in the other analyses recorded, after rendering the barley *absolutely* free from moisture.

In the analyses of Nos. 40 to 46 the fat was in each case determined simply by extracting the *absolutely* dry barley, packed on a funnel over an asbestos filter, with ether at room temperature.

The following are the average percentages for each Division:—

Division.	No of Samples	Moisture.	Fat.	Nitrogen	Fibre.	Ash.	Lime.	Phosphoric Oxide.
		%	%	%	%	%	%	%
Malmesbury...	11	11·06	1·76	1·39	6·03	2·42	·063	·66
Caledon......	6	12·35	2·20	1·23	6·25	2·03	·056	·45
Paarl.........	4	10·99	2·32	1·27	5·93	2·24	·103	·64
Tulbagh......	6	10·92	1·85	1·29	6·17	2·14	·101	·58
Worcester.....	7	10·86	1·52	1·34	6·39	2·45	·066	·69
Robertson....	6	10·73	1·59	1·63	6·26	2·70	·072	·72
Cathcart......	7	11·82	2·33	1·61	5·97	2·65	·129	·59
Summary...	47	11·24	—	1·40	6·14	2·39	·082	·62

Before commenting on the above analytical results in any way a brief digression may be made to another phase of the investigation taken up last year. The tables above given set forth results of analyses, in almost every case, of what is known as Colonial or Cape barley, and although I have also recorded some analyses of imported barleys which were made in the Capetown Laboratory, it was pointed

* Contained sand.

out on a former page of this article that investigation was needed not only for the purpose of gaining fuller knowledge regarding the composition of *Cape* barley but also to ascertain the possibilities of the Cape climate influencing the composition of two-rowed barley, as the latter became locally cultivated through successive generations. It is with regard to the latter point that I now propose saying what steps have recently been taken. Portions of nine varieties of barley which had been directly imported were analysed in the Laboratory, and the rest sent for cultivation, in each case in nine separate packages, to the Robertson Experiment Station and to Sir Meiring Beck's farm at Tulbagh. It is the intention to cultivate the barley at Robertson and Tulbagh during successive seasons, and, by analysis of the grain, to ascertain what changes in chemical composition take place concurrently with acclimatization. There has not yet been time for production and analysis of the first year's crop, but meanwhile the results of the analyses of the imported grain that is being experimented with are given below. The varieties of barley were as follows:—

60. Webb's New Burton Malting Barley.
61. English Chevalier Barley.
62. Swedish Chevalier Barley II.
63. Princess Barley.
64. Webb's Golden Grain Barley.
65. Webb's New Binder Barley.
66. Swan Neck Barley.
67. Hannchen Barley.
68. Webb's Kniver Chevalier Barley.

The results of the analyses of these nine imported barleys were as follows:—

No.	Moisture.	*Fat.	Nitrogen.	Fibre.	Ash.	Lime.	Phosphoric Oxide.
	%	%	%	%	%	%	%
60.....	11·72	1·81	1·49	3·39	2·15	·084	·89
61.....	12·33	2·01	1·40	3·78	2·62	·063	·94
62.....	13·32	2·16	1·49	4·08	2·20	·087	·88
63.....	11·21	1·98	1·47	3·65	2·59	·092	·86
64.....	13·65	1·96	1·49	3·79	1·97	·070	·78
65.....	11·38	2·32	1·45	3·20	1·98	·070	·87
66.....	13·37	1·58	1·89	4·14	2·14	·070	·82
67.....	14·03	1·96	1·80	3·88	2·36	·150	·88
68.....	14·13	1·81	1·63	3·51	2·40	·093	·98
Average	12·79	1·95	1·57	3·71	2·27	·087	·88

Now it will be observed that the sixty-eight samples whose analyses are recorded above may be classified individually into three groups: (1) Grain which was actually grown oversea—this comprises Nos. 60 to 68; (2) grain produced in the Cape Province from imported seed, and comprising Nos, 3, 4, 7, 8, 9, 37 (in part), 38, 39, 54, 56, and 57; (3) grain produced in the country from what is generally known as Cape or Colonial barley, including all not enumerated

* Substance previously dried. Fat extracted by Soxhlet's method.

in groups 1 and 2. We may go into more detail afterwards, but in the first place let it be observed that, compared with the Cape barleys, samples 60 to 68 show a rather high proportion of nitrogen taken all round, particularly Nos. 66, 67, and 68, while Nos. 61 and 65 are the nearest approach to what may be called normal. Even Nos. 60, 62, 63, and 64 average a higher percentage of nitrogen than the six barleys analysed in 1909 (Nos. 1 to 6) and the three barleys of entirely Cape origin analysed in 1910 (Nos. 10 to 12). Then, if we take group 2, representing the grain grown at the Cape from imported seed, we get from the ten samples (exclusive of No. 37) a range of from 1.29 to 1.89 per cent. of nitrogen and an average of 1.56 per cent.—no appreciable variation from that given by group 1. The third group includes all the remaining forty-eight samples. Amongst these are all the samples analysed in 1911 from the Malmesbury, Caledon, Paarl, Worcester, and Robertson Divisions, in which the average percentages of nitrogen are respectively 1.39, 1.23, 1.27, 1.34, and 1.63—the Robertson Division alone showing a high nitrogen content. Of the Tulbagh samples three (Nos. 34, 35, and 36) were grown from Colonial seed, and these gave an average of 1.13 per cent. of nitrogen; of the remaining three Tulbagh samples one (No. 37) was produced from a mixture of Colonial and imported seed, and the other two (Nos. 38 and 39) were stated to have been derived from imported seed only. The average nitrogen percentage of these last three was 1.44, so that in this instance too the purely Colonial barley showed the smaller amount of nitrogen.

The Cathcart samples were the only representatives of Eastern Districts barley examined, and they present features which call for fuller investigation. Here, as in the case of the Robertson Division, there is an all-round tendency to a higher nitrogen percentage, and the cause of this still requires to be discovered. Amongst the Cathcart barleys three (Nos. 54, 56, and 57) were grown from imported seed, and their nitrogen percentages (respectively 1.73, 1.89, and 1.44) are undoubtedly high—they average 1.69; the four samples of Colonial seed from the same Division (Nos. 53, 55, 58, and 59) gave an average of 1.56, which is also high, but which would have been only 1.41 were it not for the inclusion amongst them of No. 53, which contained no less than 2.01 per cent. of nitrogen, the highest percentage in all the sixty-eight samples analysed. What the cause of this abnormal exception to the general rule may be it is idle to conjecture without extending the investigation still further afield, but it in no way affects the general results of the investigations already carried out, namely, that as a rule the percentage of nitrogen in Cape six-rowed barleys is not only quite sufficiently low to permit of their being fully entitled to consideration for brewing purposes, but this percentage is distinctly lower than that of the two-rowed barleys, either of English growth or of English parentage, which have been analysed in the Capetown Laboratory.

Respecting the individual samples whose nitrogen percentages have been collectively discussed above, it may be interesting to inquire how many of each group or series exceed what may be regarded as the limit of normality for nitrogen. If that limit is taken as not exceeding 1.50 per cent. for the undried grain then, of the nine samples of imported grain analysed, this limit is exceeded in three cases, Nos. 66, 67, and 68. Out of the ten samples grown wholly from seed directly imported into the country (that is to say excluding No. 37) Nos. 7, 8,

9, 54, and 56 are above the limit. Amongst the forty-eight barleys produced entirely from Cape seed we find the following:—

Division.	No. analysed.	No. above limit.
Malmesbury.............	11	3
Caledon.................	6	1
Paarl..................	4	1
Tulbagh................	3	–
Worcester..............	7	—
Robertson.	6	5
Cathcart.	4	2
	41	12

to which should be added the samples investigated in 1909 and 1910:—

Division.	No. analysed.	No. above limit.
Worcester.... . ..	1	
Robertson.	6	

The proportion of nitrogen in Cape-grown relatively to imported barley seems to be paralleled in wheat and oats. In 1909 forty-three samples of wheat were examined by Dr. Lewis in the Capetown Laboratory. Of these thirty-seven were Colonial grown and six were imported seed. In the Cape grown wheat the average percentage of nitrogen was found to be 1.65 and in the imported wheat 2.35. During 1908 fifty-two samples of Cape grown oats had been similarly analysed, and in these the average nitrogen content proved to be 1.52 per cent. In other countries the average is 1.65, according to some hundreds of analyses quoted by König, while in Great Britain sixteen analyses given by the same authority give a nitrogen average of 2.09 per cent. It is curious to note that in the case of oats, as in barley, the nitrogen-content of the cereal, as grown in the Cathcart Division, is higher than in the more westerly parts of the Province. For instance, Dr. Lewis found that Malmesbury oats gave a nitrogen content of 1.52 per cent.; in the Caledon and Robertson Divisions he found percentages of 1.34 and 1.40 respectively, but in the Division of Cathcart the percentage of nitrogen was 1.66 and in the adjoining Division of Queenstown it was 1.76.

Before concluding, a brief glance may be given at the relative proportions of fibre found in the several samples of barley whose analyses are now under discussion.

The seed as imported and represented by the nine samples, 60 to 68, contained from 3.20 to 4.14 per cent. of fibre, with an average of 3.71 per cent. The proportions of fibre found in seven barleys grown in the Cape Province from imported grain ranged from 4.34 to 6.82 per cent., averaging 5.65.

In the grain entirely of Cape origin and growth, the results were as follows:—

Division.	No. of Samples.	Minimum.	Average.	Maximum.
Malmesbury....................	11	5·53	6·03	6·75
Caledon........................	6	5·90	6·25	6·64
Paarl...........................	4	5·59	5·93	6·21
Tulbagh........................	3	5·50	6·08	5·86
Worcester (1909)...............	1	5·49	5·49	5·49
Worcester (1911)...............	7	5·87	6·39	6·92
Robertson (1909)...............	3	5·98	6·50	6·90
Robertson (1911)...............	3	5·94	6·26	6·72
Cathcart.......................	4	5·48	6·35	6·95
Summary............	42	5·48	6·19	6·95

Hence the above figures indicate that the proportion of fibre is less in English-grown two-row barley of the class examined than in barley grown at the Cape.

This by no means rounds off the points that needed investigation. Comparison of imported two-rowed with Cape six-rowed barley may be of very practical importance, but it is in itself insufficient to elucidate the effect of Cape climate on the cereal. Until we have compared two-rowed barley of English or Californian growth with the same variety in South Africa, and have done similarly with regard to six-rowed barley, the whole subject will not have been looked at from all view points. Six-rowed barley in general contains more nitrogen than the two-rowed variety; this was shown some years ago by Clerc and Wahl* who, after an exhaustive study, pronounced the average percentage of nitrogen in the six-rowed variety to be about 1.92, and in the two-rowed about 1.84. That being so, it may be inferred that if Cape six-rowed barley is lower in nitrogen than imported two-rowed, much more will it be lower than imported six-rowed. Whether that actually is the case can only be definitely settled by further investigation.

* United States Department of Agriculture Bureau of Chemistry, Bulletin No. 124 1909, p. 61.

American Stocks for Cape Vineyards.

(*Being the Preliminary Report by the Committee appointed by the Department of Agriculture to inquire into the suitability of the American Stocks thus far used to reconstitute the vineyards in the Cape Province.*)

By Dr. A. I. PEROLD, Government Viticulturist, and I. TRIBOLET, Lecturer on Viticulture and Fruit Culture at Elsenburg.

As it is of the utmost importance that the main facts brought to light by the above inquiry should be made known as soon as possible, and as, owing to the pressing season being now in full swing, it will not be possible to have the detailed report ready before late in March or the beginning of April, the committee proposes to make known the main results of the inquiry in this preliminary statement, hoping to have the detailed report ready in four to six weeks' time.

The inspection had to be done in three weeks, so that only a little over 100 farms could be inspected. These are situated in the Stellenbosch, Paarl, Malmesbury, Piquetberg, Ceres, Worcester, Robertson, and Caledon Districts.

The results, grouped according to the American stocks mainly used, are as follows:—

(1) *Metallica rupestris*, also called *Constantia metallica*, is a stock that cannot stand much moisture in the soil, and that suffers easily from drought. It, therefore, does well in fairly deep, loose, cool soils that have never too much and never too little moisture. As such soils are rather rare to find, the result is that many thousands of vines grafted on this stock are suffering visibly and gradually dying. Thus in the reddish Karroo soils in the Robertson and Worcester Districts, in clay soils near Darling, Tulbagh, and at Bosjesmansvlei, near Botha's Halt in the Breede River Valley, grafted vines on Metallica are worthless. In many instances the roots are infested with phylloxera and the vines are dying off in patches. In a fairly deep, coarse, sandy soil in Dal Josaphat (Paarl District) these vines have done so badly that they will be taken out this year.

In most of the Goudini and similar soils Metallica can be safely used, but *in most soils it is a bad stock, and hence grafting on Metallica ought not to be continued in future.*

(2) *Jacquez* has long ago been known to have only a medium resistance against phylloxera. Still in deep, loose, and cool soils it does well as a rule, and there it is vigorous enough to resist the attacks of the phylloxera with success. As soon as it suffers from drought in dry, stiff loams or clay soils, or gets weakened for some other cause, its weak resistance manifests itself, with the result that the roots are so badly attacked by the phylloxera that the grafted vines suffer visibly and frequently die off in patches like ungrafted vines. This was found to be the case at Villiersdorp, De Doorns, Roode Wal (Worcester), and several farms near Robertson Village, Achter Groenberg (Wellington), etc.

In Goudini the vines (mostly hanepoot) grafted on Jacquez are nearly always superior to those on Rip. Gloire de Montpellier, and they do exceptionally well.

In most sandy and broken soils in the Paarl, Stellenbosch, and Constantia Districts the vines grafted on Jacquez still do very well, so that Jacquez can, therefore, still be looked upon as a good graft-bearer in most soils (excluding stiff clays) of the western districts. At the same time it is equally true that in practically all the stiff loams and Karroo soils of the Worcester and Robertson Districts the vines (mostly hanepoot) grafted on Jacquez are suffering from phylloxera and are frequently killed altogether.

Hence farmers wishing to plant grafted vines in the Worcester, Robertson, and Montagu Districts are warned most strongly not to plant vines grafted on Jacquez in stiff loams and in Karroo soils. In loose, deep, alluvial soils—particularly along the Breede River—vines grafted on Jacquez will stand a good chance.

In such soils, however, Riparia Gloire de Montpellier ought to stand just as good a chance, and as it certainly has nowhere during the tour of inspection been found infected with phylloxera there is every reason to prefer it to Jacquez in such cases.

(3) *Riparia Gloire de Montpellier* has not been planted extensively. It was nowhere found to suffer from phylloxera. In fact no phylloxera was ever found on a single one of its roots, although many have been carefully examined.

In deep, cool, fairly loose soils it does well, whether they are in a kloof, along a river, or on a hill. Even in fairly stiff clay soils as at Dal Josaphat (Paarl), Slanghoek (near Goudini), etc., it does well. In kloof soils it does exceedingly well, gives vigorous vines that bear well, regularly, and ripen their grapes well.

In somewhat shallow, stiff soils it frequently gives rather dwarfish vines, and it is certainly unfit for the Karroo soils, especially when these contain a fair amount of lime. In nearly all sour, alluvial soils, in practically every kloof and on many hills with a sufficient depth of fairly loose soil, it does very well.

In the Robertson and Worcester Districts it can, therefore, be planted in the sandy, alluvial soils of the Breede River, but had better not be planted in stiff loams and Karroo soils.

On the whole this stock has not been used sufficiently in reconstituting our vineyards on American stocks, and there are still many soils that can be planted with vines grafted on Rip. Gloire de Montpellier.

(4) *Aramon Rupestris Ganzin No. 1* has nearly in every case proved to be a satisfactory graftbearer. In a certain loam near Robertson Kanaan grapes grafted on Aramon are being destroyed by phylloxera. On some farms at Achter Paarlberg some vines on Aramon are suffering and a few are dying. It is not quite certain yet what the cause is in this case.

On a farm above Somerset West some stein on Aramon are dying. Since the Aramon sprouts out again, and no phylloxera is to be found on the roots, there must be some disturbing factor, such as an unsatisfactory affinity that causes some vines to die.

On the whole the vines grafted on Aramon are doing well. In very dry soils it suffers a bit during severe summers, but still it resists drought far better than either Metallica or Jacquez.

It has so far unfortunately only rarely been tried in the stiff loams and Karroo soils in the Worcester and Robertson Districts.

There is no reason why it should not do well in those soils, provided these do not contain too much lime (which they rarely do) and have sufficient moisture during the summer months.

In the Paarl District a fairly large number of vines have been grafted on the

(5) *Abrikoosblaar* or *Blinkblaar rupestris*. It grows well in somewhat sandy soils and in kloof soils, giving vigorous vines that bear well, and resist phylloxera satisfactorily. Some vines grafted on it are twenty years old. It deserves to be experimented with.

(6) *Mourvèdre rupestris* 1202 has not yet been extensively planted and most of the vines grafted on it are still young, so that much cannot be said about it at this stage. So far these vines are promising well in most soils.

Some hanepoot on 1202 planted in a very poor, sandy soil, near Retreat, are succumbing to the attacks of root-eels (nematodes). This is, however, no doubt due to the poverty of the soil and need not count against the 1202 as a graftbearer.

Conclusion.—From the above it is clear that we ought in future to make only a relative small number of grafts on Jacquez and none at all or only very few on Metallica. Aramon can be used as hitherto, and Riparia Gloire de Montpellier should be used much more than in the past.

Fig Weevils.

In reply to a correspondent who sends specimens of and asks for information regarding fig weevils, Mr. Claude Fuller, Natal Entomologist, writes:—

Correspondent's letter is accompanied by two different pests which, whilst quite distinct species, have very much in common. In the first place they are both native insects which naturally subsist upon the wild figs of our forests, and they have both found suitable nourishment in those cultivated in our orchards and gardens. Further than this, they are both beetles and belong to the same group—that is, they are both weevils and bear a resemblance and relationship to one another. The term "weevil" is supposed to have been derived from the old Anglo-Saxon "wifel", which signified "a beetle", but nowadays it is used in a much more restricted sense and is applied only to those beetles which have the head prolonged into the form of a trunk or snout. A typical and well-known weevil is that which attacks stored maize to such a large extent in this country.

Apart from the term "weevil" members of this group of beetles are often referred to as snout beetles, whilst not infrequently their Latin name of *Curculio* is used.

Thus, for instance, the larger species of the two sent is known as the "Fig Curculio" and is frequently mischievous in parts of Natal. The lesser species has not drawn upon itself so much attention, and for that reason has not yet attained the dignity of possessing a popular appellation. For the moment I cannot think of any simple name that would describe the insect and its habits, and can, therefore, only refer to it as "The bloodstained twig-borer of the Fig". "Bloodstained" because it is most distinctly marked with red blotches or bands, and "twig-borer" because the grub or larva tunnels in the small twigs of the fig, working, as a general rule, in the tips of the year's growth. This small insect does not attack the fruit, but the larger is distinctly a fruit pest, despite the fact that the adult insects do gnaw small patches of bark off and, when no figs are present, find their sustenance in the young bark.

The Fig Curculio.

The method of attack of this weevil is similar to that of the well-known "Plum Curculio" of North America, which it much resembles in appearance and general habits. The full-grown females hybernate through the winter months in the debris about fig trees, or in cracks and crevices of some near-by shelter, feeding but little during their period of inactivity. When the first crop of figs appears the female curculios, depleted in numbers by frost, natural enemies, and other vicissitudes of insect life, proceed to lay their eggs in the still green figs. This they do in a most interesting manner. First they excavate a hole of a depth equal to the reaching powers of their snouts; this is oval in outline and about one-tenth of an inch wide by one-fifth of an inch long. This completed, the insect makes a cavity in one of the sides of the pit, turns about, and deposits its

egg, placing it at the bottom of the secondary cavity. The loose particles which have accumulated are then gathered together and packed in a glutinous wad into the mouth of the pit so as to very effectually protect the egg. About three days after it is laid a white footless grub emerges and makes its way to the interior of the fig, and in a little under three weeks is full grown. About this time the fig falls to the ground. The grub changes to a pupa inside the fig and rests in this stage for a week, when it emerges as a somewhat humped-back long-snouted beetle, of a dark bronzy brown colour, dusted over with a light grey powder, resembling the "bloom" of a fruit.

The females from this first brood of the first crop deposit their eggs in the figs of the second crop, and it is their progeny which hybernate over until the next season. The insect is, therefore, a two-brooded one.

No experimental work has been done so far as relates to the application of insecticides for this pest, but spraying with arsenate of lead would suggest itself. However, speaking from a certain amount of experience, a lot of excellent control work can be done by carefully collecting and destroying the infested figs of the first crop, the conspicuous egg-punctures being easily recognized. Again, with decently grown trees the beetles can be collected by jarring them on to sheets spread underneath. It is to be remembered that every female captured means a number of figs saved, providing, of course, that she has not already been given full opportunity to dispose of her burthen of eggs. A combination of observation and attention should save the bulk of the first crop and quite protect the second. Cleaning up the debris and fallen leaves under the trees and general clean culture will also eliminate many opportunities of a successful hybernation of the adults of the second brood.

The Bloodstained Twig-borer.

Unfortunately, we are not so well acquainted with the life history of this further fig pest. The observations made so far go to show that it is, in all probability, a one-brooded insect. The adult beetles have been observed emerging from their tunnels in November and December, and their eggs are soon deposited beneath the buds near the apex of a growing shoot. The larvae burrow downwards through the centre of the twig, stopping its growth, and calling attention to their presence by particles of excrement thrown out through small holes.

They appear to feed in the stems for the better part of the year, but do not tunnel very far down.

Infested trees under observation give evidence of continuous attack from year to year, and it is quite obvious that, whilst the actual egg-laying of the insect is difficult to prevent, the practical ridding of the tree is not difficult of consummation. As soon as the grower has learned to recognize the visual indications of the presence of the borers he has only to remove the infested twigs from the time when they first become noticeable (January) so as to get the pest well under control.

There is one point to be borne in mind in the case of both these insects, and it is that, as a general rule, the infestation of garden figs originates mainly from wild figs. The removal of such will, therefore, at once commend itself where the growing of figs is contemplated.

Plant Poisons—III.

By Joseph Burtt-Davy, F.L.S., F.R.G.S., Government Agrostologist and Botanist (Transvaal).

(*Continued from page 223.*)

PLANTS WHICH PRODUCE THE SYMPTOMS REFERRED TO.

The plants producing the symptoms described in the preceding article are grouped by Guy and Ferrier as follows:—

Narcotics.—The classical example is the opium poppy, *Papaver somniferum*, which contains the alkaloids morphine and thebaine. Species of Papaver, both native and alien, occur wild in South Africa.

Delirants.—In this group are classified *Datura stramonium*, *D. tatula*, and *D. Metel*, containing daturine; *Solanum nigrum* and other species, containing solanine; *Cannabis sativa*, containing cannabinon or the volatile oil of hemp, and trigonelline; *Lolium temulentum*, containing picrotoxin; and the poisonous Agaricineæ, containing muscarine and agaricine.

Inebriants.—In this group are classified several European and North American species of *Artemisia*, containing santonin and absinthic acid. Of this genus we have but one native species in South Africa (*Artemisia afra*); another species, *A. tenuifolia*, a native of North America, has recently become naturalized as a weed in the Orange Free State and is considered a suspect.

Convulsives.—Here are classified the tropical African species of Strychnos, containing strychnine, brucine, and curarine. Several other species are native of South Africa, some of which are believed to contain poisonous properties.

Depressants.—These include the species of *Nicotiana*, containing nicotine; *Conium maculatum*, containing coniine; species of *Lobelia*, containing lobeline; species of *Cytisus*, containing sparteine; and several other leguminose plants.

Asthenics.—These include members of the Rosaceæ, Euphorbiaceae, and Leguminosae, such as *Pygeum* and *Prunus*, *Jatropha*, and *Manihot*, *Phaseolus* and *Lathyrus*; several of these contain glucosides which, under the action of enzymes, produce hydric cyanide. Also included are species of *Rumex* and *Oxalis*, producing oxalic acid; *Nerium oleander*, yielding oleandrine; species of *Strophanthus*, yielding strophanthin and incine; species of *Urginea*, *Agapanthus*, and *Crinum*, containing scillitoxin and scillain; and species of *Jasminum*, containing æsculin.

Purgatives.—These include species of Aloe, containing aloin; some members of the family Cucurbitaceae, containing elaterin, colocynthin, etc.; species of *Garcinia*, containing gambogin; *Ipomoea*, containing convolvulin, *Convolvulus*, containing jalapin;

Croton, containing crotonal and crotolinic acid; *Euphorbia*, containing euphorbin, *Linum*, containing linin; and *Cassia*, containing cathartic acid; also *Ricinus communis*, containing ricin; and *Plumbago capensis*, containing plumbagin and oil of plumbago.

Abortives.—These include *Juniperus sabina*, yielding oil of savin; *Claviceps purpurea*, containing cornutine, sphacelinic acid, and ergotinic acid; and *Ruta graveolens*, yielding oil of rue and euodic acid.

Irritants with Nervous Symptoms.—The following plants furnish poisons which act as irritants, causing also nervous symptoms: Species of *Sium* and other Umbelliferae, containing such alkaloids as cynapine and cicutine, or resins such as œnanthin; and species of *Cytisus*, *Sophora*, and other Leguminosæ, containing the alkaloid cytisine.

Simple Irritants.—Among the plants producing poisons which act as simple irritants are the following: Species of *Zantedeschia* (Richardia), containing acrid juice; Thymelaeaceae, containing mezerinic acid; *Scilla*, containing oil of jonquil; *Clematis*, containing clematine; *Anemone* (anemonin), *Ranunculus* (acrid juice); *Valeriana officinalis* (valerianic acid, oil of valerian); *Ligustrum* spp. (ligustrin and ligustron); *Agrostemma Githago*, *Anagallis arvensis*, and *Dianthus* spp. (smilacin); *Cynoglossum* spp. (oil of hound's tongue); *Rhamnus* spp. (frangulin); *Papaver* spp. (rhoeadin); *Drosera* spp. and *Pinguicula* spp. (acrid juice); *Linaria vulgaris* (oil of snapdragon, gratiolin); *Polygala* spp. (polygalin); *Euphorbia* spp. (euphorbin); *Excoecaria* spp. (oil of euphorbia); *Urtica urens* (formic acid); *Viscum* spp. and *Lepidium* spp. (acrid juices).

(*To be continued.*)

Technical Education.

By M. A. Ruane, Pretoria.

"I say not", said President Roosevelt in his address to the Sir Swire Smith Commission, "that education has made America, but without it America is lost".

Before I say anything about our position towards technical education at the present day, perhaps it would be well to direct attention to what has been done in other countries in this very important matter. It will, at any rate, help to show us what we should and what we should *not* do, and we shall probably benefit by their costly experience.

A Royal Commission from England went to inquire into the effect of technical education upon trade on the Continent in 1882, and reported as follows: "Our Continental rivals have learned everything from England that she could teach them; more than that, whilst England spent her energies in developing machinery which the Continent bought from her, they spent theirs in developing the brains of their youths by means of the best technical education. They had put brains into their work and brains had begun to tell so much that in many cases they were beating England at the very industries England had helped them to establish."

The Commission further stated that in *all* cases of efficiency and successful competition in the world's markets they were able to trace the influence of the technical schools, and that where the schools were best equipped and best administered the industrial competition of those who had been trained in them was the most effective.

In the race of industrial progress Germany has undoubtedly won her heat, and may come off with "the palm" in the final. To-day one-fifth of the German population attends technical schools; thus it will be seen there is always an army of boys and girls well trained, intelligent, and qualified for any position. There is no lack of well-equipped, well-staffed, up-to-date technical schools. All classes are catered for, and in the schools can be found the workingman's son who wishes to better his position and the budding manufacturer who seeks a thorough, practical, and scientific training. In these schools there are various machines installed, and the students are taught to pull them to pieces and erect them again so that they may thoroughly understand the functions of each part and the complete whole, and further to make the practical side of their education the stronger.

Going over the border into Austria one finds that education has a very firm hold. In Vienna one is struck with the intelligence of the boys and girls that is in evidence. On leaving school at fourteen they are compelled to take eight to ten hours per week at technical continuation classes till they reach seventeen years.

In France education has been left too much to private enterprise and to the enthusiasm of individuals to have made much headway.

Is not Denmark a marvellous example of what technical education has done for agriculture? Their exports have increased by six times since 1881.

Switzerland might well be christened the educational laboratory of the Continent with her excellent schools and semi-compulsory system.

Wherever one goes on the Continent one can readily see the extreme interest and belief in technical education. It is not regarded in that indifferent, haphazard manner it is here at present, but it is regarded as a definite means to a definite end, and that end is advancement and success.

The governing boards of all continental technical schools are composed of *experienced, practical men* who keep in touch with the work and also take a deep interest in the progress of the students.

One hears so much of America nowadays that one is apt to get a little annoyed and somewhat incredulous, for the average Yankee, to put it mildly, has a somewhat overlucid way of talking of what is going on across "the herring pond", but to get a true account of American industrial progress read the report of the Mosely Commission which went out there in 1903, and there you will find they are making enormous strides with technical education. The members of that Commission were well-known educationalists, professors, clergymen, chairmen of educational boards, etc., men holding widely different views, and, as a body, amply qualified to judge the question from every possible aspect. The American parents realize that their children are the nation's greatest asset, and that their education is the best investment they can make, and altogether there is a settled belief in the possibilities of a good technical education as a means of success. Nearly one-third, and, in some places, almost one-half, the public expenditure goes to education. A great feature is made of research work, one of the main ideas being to develop the originality of every individual student by means of practical experiment so as to turn out practical thinkers rather than mechanical workers.

England spends a huge sum annually in the cause of technical education, and she has a splendid system of co-operation between the different grades of schools. One department of the Leeds University cost over £80,000 to build and equip with machinery, etc., and it is run at a cost of almost £5000 per annum. A glance at this institution's excellently planned and extremely wide, embracing, illustrated syllabus will suffice to show that equipment there is quite complete. even to a lavish extent. Throughout England the requirements of all are catered for by way of technical schools.

Ireland and Scotland are bent upon being in the van of technical educational progress. The latter has put up a large school at Galashiels at a cost of £20,000, and several smaller ones in many other centres. Ireland has levied a special rate on her entire valuation to be solely used for technical education. The report of the recent Canadian Government Commission speaks trumpet-tongued for the Irish system. The governing body in Dublin are *intensely practical men*, and Ireland's increased exports and progress are accounted for by the practical turn her educational system has taken in recent years.

I think I may now ask what are we doing in South Africa for technical education? Alas! I fear, it must be admitted *very, very little*. Let us not try to deceive ourselves and believe we are if we

are not. I suggest that we come to hard, concrete facts and ask: *Where are the results?* We have a country teeming with raw material of every description, and if we are doing any real, practical good, where, I ask, are the industries (which are the natural upshot of technical training) springing up in the country? Where are our practical boys and girls engaged in building up their country and imparting their technical knowledge to others? The youth of South Africa are crying aloud for technical education, and I can vouch for their ability and aptitude if they are only given the required training.

This is not a political party matter, and I sincerely hope that no man will approach this very important question in such a spirit. I hold it is the duty of every citizen of South Africa to assist in every possible manner the Minister of Education, who, I believe, is giving this matter very serious consideration. The fact of his calling the recent Conference shows he is anxious to formulate a scheme of technical instruction for the Union.

Speaking of the Conference reminds me the Directors of Education told us there that technical education belonged to the Provincial Councils or at least something tantamount to that. If so, surely for the sake of South Africa's future, this little difficulty can be surmounted.

I would like to see a connecting link formed between the secondary schools and the actual business of life—I mean a sound system of technical education on a national scale, not merely preparation and theories but the actual work entered upon.

It may be argued that the systems of technical instruction briefly referred to above are of older countries, and that South Africa is too young and the time is not yet ripe. Nonsense! Take a comparatively new country, Australia, which benefits to the extent of £23,000,000 annually from wools, and we have the same favourable conditions here and yet wool is considered not much more than a by-product by the majority of people. Australia and New Zealand derive a further benefit of four or five millions by manufacturing instead of exporting all their wools. I may add New Zealand had a magnificent display of woollen and worsted goods at the Johannesburg Agricultural Show last year, comparing favourably with English goods in price, style, and finish, and beating them considerably in quality.

It has well been said that "knowledge is the key to success in the life of a nation or of an individual". I contend if such a *key* were placed within reach of every member of the white community in this country the near future would see an industrious, prosperous, contented South Africa.

Secondary or higher education and the modern technical systems go hand in hand and cannot be divorced. Under the antiquated "rule of thumb" systems of fifty or one hundred years ago the technical student did not require a higher education, but those days are gone and there is an absolute necessity to become up to date.

Later, I intend to write on "scientific dipping", the main points to be observed, and why farmers object to it.

What is Fowl-Sickness.

By. J. D. CASEY., F.U.S.S.

THIS question I asked myself nearly twelve years ago, when my attention was called to a specific disease denoted by watery evacuation from the bowels—a fatal disease which is responsible for 45 per cent. of the deaths in poultry yards along the Natal and Cape coasts. And yet the lay student and poultryman does not appear to know anything concerning the cause of the (so-called) fowl-sickness. I am told frequently to-day that fowls sent to me for examination have died from the usual cause. Now, fowl-sickness is nothing more than a wrong diagnosis of cholera, diarrhœa, and enteritis (which occurs in five different forms). Thanks to Mr. S. Wayne, Mr. H. W. Hudson Cope, and other gentlemen, I have been able to investigate with success many of the forms of enteritis, but cholera being so prevalent from October to January I will deal with it first.

Cholera.—There is no doubt that, independent of cholera, many evils are the offspring of negligence in paying due regard to the situation of the poultry run, as also to its foundation. Certain sites and grounds are as essential to the health of fowls as they are to dogs and other animals; and all inquiries into the nature, causes, and treatment of diseases can only end in but a very limited degree of success so long as individuals will persist in trying to rear birds in an unnatural manner, associated with a disregard to "sanitarianism". Again, often from want of a careful observance of the natural habits of a bird, but more especially through ignorance of the barest outlines of anatomical construction, simple functional disturbances are overlooked, and fatal diseases become established. An interested poultry-breeder should always be on the alert. Every dead bird not sent to an expert should be opened and its internal appearance noted and remembered. As observed by an eminent medical writer, "no exclusive doctrine will now stand the test of well-directed pathological inquiry, the main object of which is to connect all organic changes (lesions) and functional derangements with their symptoms and causes, with the view of applying rational remedies and prophylactics. The investigation and elucidation of the nature, course, and causes of those changes constitute the prominent objects of the science of pathology. By the aid of morbid anatomy and clinical observation during life, pathology seeks to establish the relations of the changes which lead to the lesions, and so to connect the general progress of disease with its symptoms and signs".

And so in examining a dead bird the observant amateur finds a lesion or unnatural structural appearance, which he knows from practical experience should not exist, and the pathologist enlightens him as to its connection with the symptoms during life. I, in the latter position, frequently receive birds for examination where it is

stated numbers have previously died in the same way, with a request for information as to the cause but no statement as to any examination having been made on the part of the sender. There are so many opportunities of investigation lost; all morbid products have an origin, and that frequently exists, certainly in poultry, in the method of feeding and general management. Thus in cholera I have pointed out certain causes favouring its production, and, as I shall further show, there are symptoms and post-mortem appearances which, if carefully noted by the amateur in the first instance, would be valuable in saving his other birds.

This disease, as it occurs in Natal, is more rapid in its course and differs somewhat in its symptoms from outbreaks I have observed in the United States. The incubation in America is placed at 52 hours. In the case of ten fowls inoculated by me, the average period of incubation was twenty-eight hours, and it varied from twenty-one to thirty-eight hours. The virus evidently varies in its activity in this country. If the symptoms are noticed early the bird will be found dull and listless, rocking its body, and dragging its legs (as though they were cramped) when walking. The feathers are ruffled and the wings drooped; the eyes are more or less sunken, the eyelids swollen, and frequently an irritable condition of the latter exists, causing the bird to scratch the parts. Appetite is suspended, but there is frequent thirst, and inclination for warmth is manifested by the affected birds huddling together, or keeping in the sun.

At this period there is great weakness, the affected bird becomes drowsy, and may sink into a sleep, which lasts during the last day or two of its life, and from which it is almost impossible to arouse it. Diarrhœa is present throughout, being at first glossy and mucous, and subsequently white and frothy or bubbling. The fancier must take notice in all cases of sudden and profuse diarrhœa to which his attention is called, to exclude the idea of the presence of renal diseases, for purging is an effort at elimination of effete materials, and its sudden arrest by drugs may induce eralmic convulsions or coma and cause death.

As the malady proceeds the depression is more marked, the eyelids are closed, the head carried low, and swollen from effusion of serum and congestion of the blood vessels. The gait is staggering, and the evacuations become very white, clear, watery, streaked with blood, and offensive. The tail feathers and also those about the vent are wet and matted together. The mouth will be found full of dirty, sticky, or frothy matter, and the same is frequently seen to issue from the nostrils. The comb becomes flaccid and deepened in colour towards its border. All these symptoms continue to increase in severity as a fatal termination approaches. The bird is disinclined to move, and either stands with its back raised, the wings being away from its body, and drooped, or squats on the ground with its beak in the earth and the wing spread out. The breathing is short and laboured, the crest swollen and black in colour, the vision almost lost, the plumage lustreless, and finally the bird dies in a state of stupor or convulsions. According to Dr. Flemming "with some birds shortly before death there are nervous movements; the respiration becomes laboured and convulsive and shakes the body; at intervals a harsh guttural cry is emitted—a kind of hiccough. At the same time the feet and wings are agitated and contorted, a little foamy saliva from the beak, a small quantity of white or greyish bubbling fluid is expelled from

the anus, and the bird perishes. In other cases there appear to be no convulsions, and it is not rare to find the bird dead on the nest without a straw being disturbed. Others before death turn round as if attacked by a vertigo. In some cases there is a kind of vomiting of a glossy, yellowish-white fluid, and the diarrhœa, which is nearly always present, is either grey, white, yellow, or black in colour, or streaked with blood, but constantly foamy or bubbling".

The duration of cholera may vary from nine hours to eight days. The cause of fowl cholera is a minute germ; it is about one 50,000th of an inch broad, and three times as long. It is one of the bacteria, and has been called by some micrococcus and by others bacillus; it is easily destroyed by disinfectants, and in a temperature of 132° F. for fifteen minutes. The germ is transmitted by contagion, breathed into the body, or taken in with food, and transmitted by copulation or through wounds in the skin of the bird. Once admitted to the body the germs multiply in the blood and other liquids of the body. The circulation is reduced 30 per cent., while the density or consistency of the blood is increased about 8.50 (S.G.), thus affecting every organ and function. Death results from poisoning by the substances produced by the germs, and in chronic cases by the interference with the functions of digestion, assimilation, and nutrition.

The germs grow best at 89 to 105° F. It has in itself no power of movement outside the body. The blood, after sixteen hours' infection, shows oval globules of slate-coloured pigment, and other brownish forms resembling *Epidermopthes bilobatus*, while the smaller forms are like *Bacterium sanguinarium*. At this stage the temperature is 110° F., 4° above normal.

Post-mortem Appearances.—The body externally is usually of a purplish tint, with the exception of the crop and abdomen, over which the colour is of an inky green, while internally lesions peculiar to this disease are always apparent. On examination of the birds forwarded to me, the following striking phenomena of cholera were noted:—Lining membrane of the mouth livid, except toward the outside, which was pale; throat purple and full of sticky, dirty yellowish matter; tip of tongue hardened and partly detached; eyes sunk deep into the sockets, eyelids emphysematous or swollen; gizzard empty, except a little gravel and thin acid fluid; muscular substance of a deep red colour; intestines extensively inflamed, with extravasated blood patches under the mucous membrane, and here and there corrosions. The matter contained in the intestines was of a dirty, thin ichorous, or acid nature; liver deeply congested and increased in volume, very dark, or dark green; lungs slightly congested, and pleuritic exudation; heart purplish-red, and studded with ecchymose, or extravasated, blood-spots; pericardium contained an excessive amount of straw-coloured fluid.

Treatment.—All forms of medical treatment up to now have been unsatisfactory. Many preparations have been recommended by D. F. Salmon, D.V.M.; J. T. Robinson, M.D.; J. W. Hill, F.R.C.V.S.; E. Cobb, F.Z.S.; Dr. Kitt, and others; but all these gentlemen have not been careful to ascertain that they really were treating cholera, or they have tried their remedies on so few birds that their results were untrustworthy. I know of no treatment better than taking the bird in the first stage, before the blood begins to thicken, and administering some strong antiseptic. In experiment I find that the virus is destroyed by 1 per cent. salicylic acid, 1 per cent,

benzonic acid and carbolic acid, and ½ per cent. sulphuric acid. After this dose, give 1 oz. of flour, to which add ¼ oz. bismuth carb. three times a day.

I have cured many birds this way, but only when taken in the first stages. Pure water should be allowed *ad lib.*, with strengthening food. In dealing with the subject sanitarily, complete isolation of the diseased bird should be made; cleanliness, protection from the sun, change of food, good water, and removal of locality are all matters of importance.

Inoculation.—The Pasteur system was introduced in 1880 by cultivating the cholera germ in chicken broth, showing that it could safely be used for vaccination. In cases where I have vaccinated rabbits and guinea-pigs 85 per cent. were immune from cholera. But with such a variety of poultry no line can be drawn, as each fancier will require to experiment on each different class of fowl. I have vaccinated common fowls where cholera was prevailing badly, where I left some stock not vaccinated. The latter all died. I only lost ½ per cent. of those vaccinated. I have every reason to believe that inoculation will prove the only means of preventing cholera when a line can be drawn as to the treatment of each breed. Vaccinate a hen, and in six days her system will be thoroughly inoculated. Then cut off her head and catch all the blood in some vessel, pouring it afterwards upon clean white paper to dry. A half-drop of this dried blood is sufficient to vaccinate a fowl. The *modus operandi* is this: Catch the fowl you wish to operate upon, and, with a pin or knife, make a little scratch on the thigh, just enough to draw blood; upon this place a small piece of paper upon which the virus has dried, and let the fowl run. This will prove the means of checking one of the deadly causes of so-called fowl-sickness. In my next paper I will treat enteritis bacterial.

The Agricultural Show Season, 1912.

SHOWS IN THE CAPE PROVINCE.

The Rosebank Show, as the largest and most representative of Western Province exhibitions, calls for a little more attention than could be allotted in the last issue. In the general notes then published it was clearly demonstrated that this year's effort was, if anything, on a larger scale than usual. But for all that there were many features at Rosebank this year which should call for the most careful study on the part of the executive. Taking the industries of this country in the order of their commercial importance, it must be admitted that wool and mohair rank very high. Yet all that could be seen of these great representative agricultural industries was three entries of wool and two of mohair, just one in each class, the excellence of the prizes notwithstanding. Surely there is room for action here. If the wool and mohair growers will not take more interest in the sections devoted to them entirely, some steps should be taken to bring home to them the necessity for doing so. Failing effect, it would only be right to withhold the prizes, failing sufficient competition to justify the judges in awarding them. The ostrich feather classes were in much the same position. In only one of these classes was there any attempt at competition, and here there were two entries. The others only attracted one entry each. The whole of the section, in which no less than £20 was offered in prize money, comprised exactly six entries. These are assuredly matters which should give rise to some thought and discussion, for such exhibits are of little or no educational value. The value to the country and the public generally lies in the competition.

The other sections, however, were quite interesting and mostly representative, with the one exception of angora goats, the entries here being only eleven, while at former shows here we have seen as many as close upon thirty. However, the quality was right, and that is the great consideration.

As far as numbers were concerned, the horses, mules, and donkeys were an easy first, the cattle section coming next. But though the numbers were quite satisfactory, the show of horses was scarcely up to the standard of many past Rosebank shows. In fact many people were disappointed. The judges selected "Whyte Melville", the recently imported Thoroughbred stallion now stationed at Elsenberg Agricultural College as the best of his class, but the money prize went, of course, to the next on the list in the shape of "Mago Pico", exhibited by Mr. MacDonald, of Breyten, Transvaal. The next on the list was from Robertson, "Yukon", owned by Mr. J. S. de Wet, of Ashton. Melck Bros., the well-known breeders of Kersefontein, Berg River, were awarded first for imported Thoroughbred mares with "Grand Lady", the only competitor. "Comet", owned by J. P. de Villiers & Son, of Beaufort West, took first for Colonial breds in the

same section, and the same owners took first for Colonial bred mares with "Beauty". There is evidently some misunderstanding even yet as to the most suitable types for the more useful classes of horses, as here, as at Robertson, the most horsey district of the Western Province, the prevalence for the Hackney strain was very marked in some of the general exhibits. The judges were bound to notice this. That the Thoroughbred is coming into its own again is, however, distinctly shown in some of the younger stock. In saddle and carriage horses there was again quite a good display, but the heavy draught types were not well represented. Some years ago the Rosebank show ground generally had some good specimens of this type, notably in Clydesdales. But whether it is the motor-driven lorries in town that have rendered these animals more scarce, or the increasing use of heavy types of mules on the farms that is finding more and more favour, these very useful and decidedly attractive types are not seen now to the extent they used to be. This is a pity, as the heavy type of mare should be more known and used, especially if it is necessary to keep up the supply of the heavy type of mule. The team of mules which took first prize consisted of the excellent span shown by Mr. W. C. Hoffman, of Weltevrede, Riebeek West, at Malmesbury, Paarl, and other shows in the west. These are undoubtedly as fine a group as has ever been seen in this country. That the mule has come to stay was fully evidenced by the excellent display of jack donkeys, many of them fine specimens of the best type of Catalonian. The breeding of mules is becoming a large and important industry among the farmers of the Western Province.

In the sheep section there was a very good show and plenty of competition in both sub-divisions. For judging purposes, the section devoted to the woolled types was divided into "Tasmanian and allied types" and "Rambouillet and allied types". How the breeders will receive the new arrangement has yet to be seen, but as it is being adopted at other shows this year the criticism may be looked for later. In the fine-woolled Tasmanian lot Mr. F. C. Bayley, of Deelfontein, took the championship for rams with the winner at Beaufort West. Mr. J. H. King, of Tarkastad, took the robust-woolled championship for rams. Messrs. C. Adams & Son took both championships for ewes. In the Rambouillet classes, Mr. J. G. Sieberhagen came out well on the top, and Mr. F. C. Bayley again scored. Taken all round, the sheep section, generally, though numerically weaker than on some previous occasions, may be described as more than satisfactory, but the great bulk of the exhibits came from afar, the immediate sheep districts of the Western Province contributing nothing to the contest. These districts were content to enter in the heavy type sections, and among these were some fairly good specimens of imported English breeds.

There was a great show of cattle, but, practically speaking, all of milking strains. Foremost has to be noticed the really fine display of Frieslands. Rosebank can always be relied upon for a good display of these animals, and, if anything, the 1912 exhibit seemed to be better then ever. The young stock in particular is full of promise this year. The principal winners were Mr. D. J. Schneider, of Lower Paarl, who took two championships and a first with a really magnificent bull, Mr. C. Leonard, Gloria Estate, Caledon, Mr. Ackermann, of Maitland, and Messrs. Walters Bros., of Malmesbury.

In the Ayrshires, the well-known Broadlands herd, belonging to Mr. J. Rawbone, came well to the front again, that great prize winner, "Handsome Nell", being the winner in the open classes. Other prizes also fell to this herd. The champion bull was found in Mr. O. C. M. Barry's representative, the reserve champion being found in a two-year-old bred by Mr. Rawbone, the same owner taking championship honours for cows with Blanche IV., bred at Broadlands. There was such an excellent collection of young bulls and heifers in this section that it was quite one of the most attractive features of the show. As this is the only cattle section in which Mr. Rawbone exhibits, it is interesting to note that the Governor-General's prize for the greatest number of points scored by an exhibitor in the cattle section was awarded to that gentleman. This will give some idea of the standing of the Broadlands herd.

Pigs were not a strong feature, and the varieties shown would not appeal to all breeders. Poultry was, on the other hand, a very fine section, and with the pigeons attracted a great deal of attention. There was very little competition in the produce and vegetables. Why this should be in a section of the country where each of these represents a large proportion of the agricultural activities is beyond comprehension.

The pride of the whole exhibition was, undoubtedly, so far as local production was concerned, the magnificent show of fruit. Although a little late in the season for some varieties, there was scarcely anything missing of real importance. If not present in the form of fresh fruit it was there either dried or preserved. The condition of all the exhibits, too, was most pleasing. Its freedom from spot or blemish was remarked upon by all. In fact the only criticism offered was in the form of the perennial question: Why cannot we be supplied with fruit like this instead of the sorry stuff offered by the dealers? Why, indeed? There is no room in these pages to do full justice to this section in detail. Suffice it to say that it was a credit to the fruit-growers, and shows in unmistakable terms the great advances they are making towards the ultimate establishment of a most important industry. The dried fruits were a picture. The wine show was also very good, but as the visitors had to be content with looking at the tempting array they had to be satisfied with commenting on appearances only. The riding, driving, and leaping competitions were as popular as ever, and attracted what we understand to be a record "gate".

THE MIDLAND SHOW AT GRAAFF-REINET.

The Midland Agricultural Society scored a great success at Graaff-Reinet with its 1912 show, opened on the 5th of March. Here were to be seen a really fine display of representative specimens of the great industries of the midland districts of the Cape Province. The show of Angora goats and sheep was quite good, while the wool and mohair evoked most favourable comments from those best qualified to judge. The ostrich holds a prominent place here, and as a consequence, the show of feathers was on quite the grand scale, and was described as the best ever seen at Graaff-Reinet. The competition in all classes was quite keen, and the judges expressed themselves as puzzled how to allot some of the prizes. The principal prize-winners in the wool section were Messrs. R. Rubidge, of Wellwood, Graaff-Reinet; D. G. and

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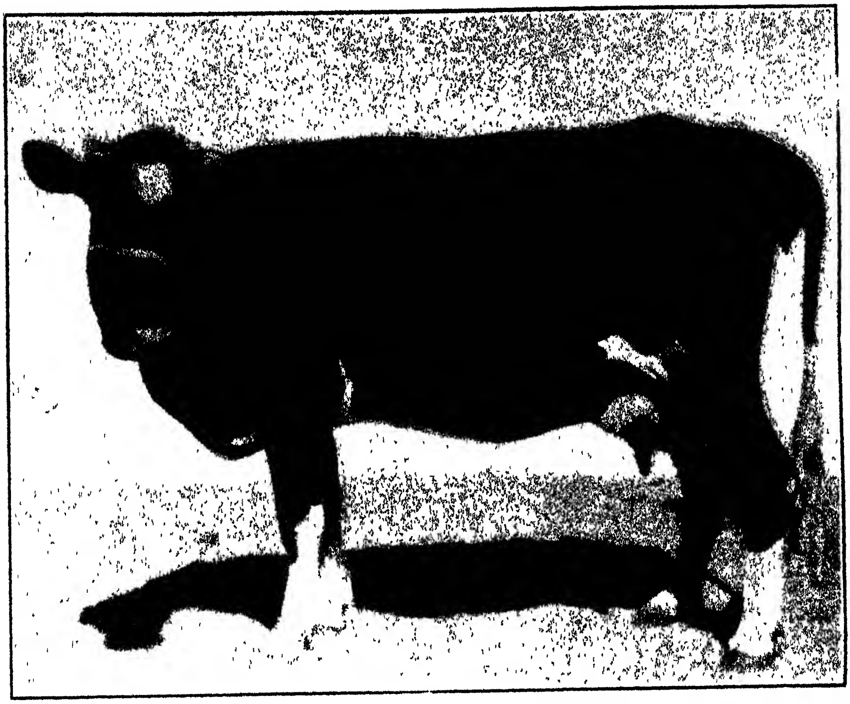

Champion Friesland Cow (Middelburg, Cape). Mrs. C Vermaak, Kromhoogte, Steynsburg.

Champion Friesland Bull (Middelburg, Cape). Mr. J. W. Vorster, Middelburg.

W. Collett, Archie Luckhoff, and A. J. Watermeyer. R. C. Holmes and A. B. Hobson led in mohair. In ostrich feathers the leaders were Messrs. W. E. Murray & Sons (champion exhibit), Alf. White, Geo. White, W. Rubidge, F. C. Hallier, and H. J. Collett. In the Merino sheep classes the fine-woolled championships fell to B. J. du Plessis (ram) and F. C. Bayley (ewe). The robust championships were taken by J. S. Minnaar (ram) and Archie Luckhoff (ewe). There were two sections for Angora goats, the one open and the other for "veld-fed, not stabled or blanketed". And there were, as a consequence, four champions. Of these, the open ram class fell to Cawood Bros., as well as the ewe. In the veld-fed section R. C. Holmes took the ram championship and W. Guard Hobson that for ewes. All the other sections were well contested, including horses, cattle, pigs, poultry, and produce generally. Graaff-Reinet has good reason to be congratulated on the 1912 show.

THE MIDDELBURG (CAPE) SHOW.

The fifth annual agricultural show at Middelburg (Cape) was opened on the 7th of March following immediately after the Graaff-Reinet fixture, and was as fine an exhibit from the purely pastoral point of view as could be expected in the conditions which prevail. The show was continued for three days and was patronized very liberally by the local people and the large number of visitors from other parts. As these sections are essentially Karoo the whole show partook largely of the conditions which prevail. The main features were, consequently, farm stock and pastoral products, but for all that there were many features of outstanding merit which strongly contradicted the prevalent notion as to the essential aridity of that great slice of the Cape Province. The weather was warm and dry, and as a consequence there was sufficient dust to remind people that however productive the Karoo may be under careful and energetic management it is still a far from humid section of the Union.

In discussing this particular show the principal point for consideration is the remarkable advances made by the society in the comparatively short period of its existence. The 1912 fixture was the fifth from its inception, and as each year increases the numbers of entries and the high standard of quality is more than maintained season by season there would seem to be a great future for this particular centre.

Prominent among the activities of these mid-Karoo societies has been an endeavour to establish the principle of field trials for agricultural implements more particularly suitable to the local conditions. Cradock made the start and Middelburg has been following suit in a fairly effective manner. This year the implements to be tested were dam scrapers, but the result of the trials does not seem to have been over satisfactory. The original prize offered was £100, but this sum was withheld on the grounds that none of the implements exhibited were of really outstanding merit. The judges, however, in view of several of the implements competing being considered useful and likely to be improved in the near future by being specially adapted to local requirements, decided to encourage further development by awarding special prizes. For this purpose the implements competing were divided into wheeled scoops and graders, and prizes were awarded as follows:—A special prize of £25 to "York's Wheeled

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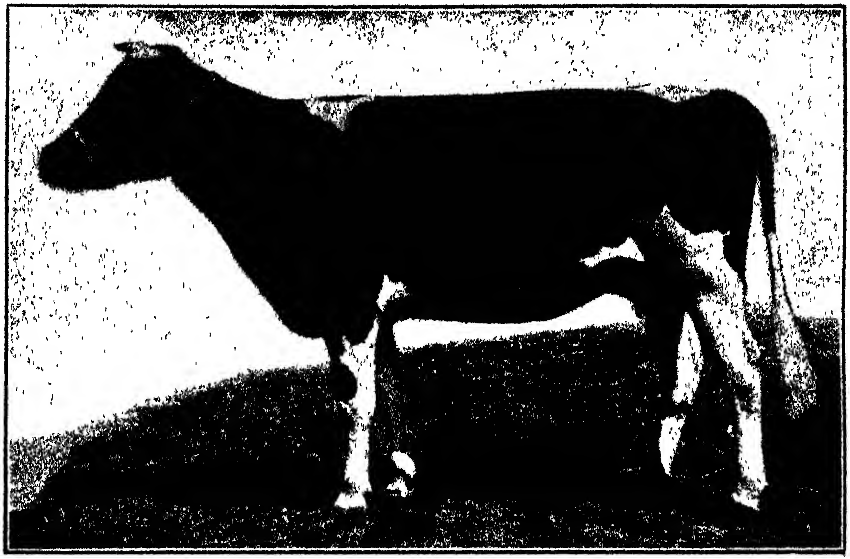
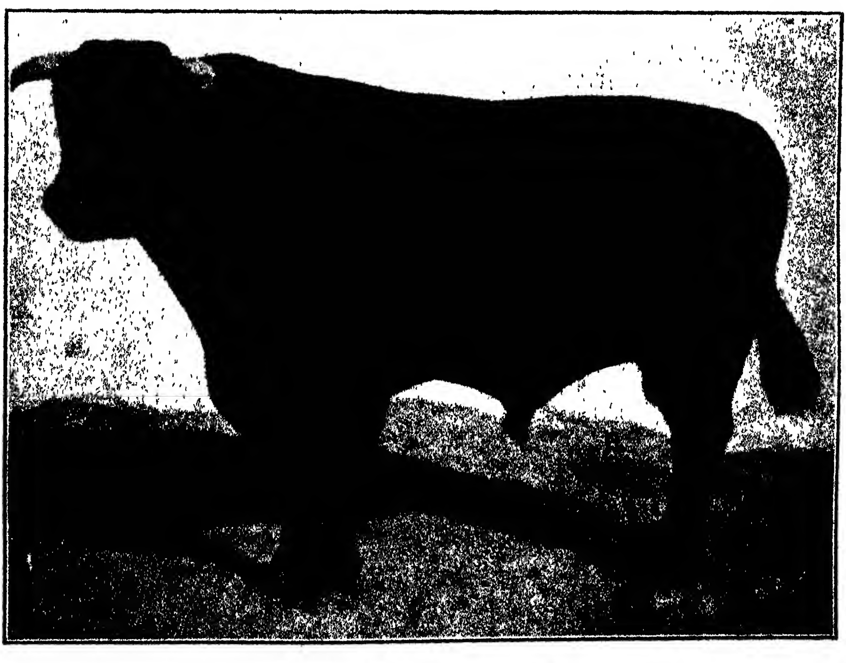


Champion (Malmesbury) S.A. Bred Cow, Friesland. Mr. J. S. Greef, Malmesbury.



Champion Shorthorn Bull (Middelburg, Cape, and Port Elizabeth).
Messrs. Geo. King & Sons, Bedford.

Scoop " and special prizes of £10 each to " Stirk's Glide " and " The Cuming Grader ". The judges further remarked that the principle of the revolving bowl in the York Scoop is undoubtedly the best, but the method employed for working it is cumbersome. Stirk's Glide is described as a very useful, well-designed, easily handled implement, though rather small for local requirements. On the Cuming Grader they remarked:—Takes a good load and would do good work if thoroughly understood, but must have more convenient arrangements for reversing the mould-board.

In the stock lines there was great competition in nearly every section. The horses were an excellent exhibit, including Thoroughbreds, Hackneys, and Arabs. The draught and riding horses were mostly of the lighter types, but they were quite good of their class. Among the winners in this section were Messrs. H. Nourse, S. Meintjes, S. W. Vorster, R. H. Struben, D. O. Turnbull, A. J. Celliers, E. F. Bacon, P. van Heerden, Edwards Bros., J. O. Southey, Geo. King & Sons, P. Jones and E. T. Gilfillan, P. Jones, sen., J. H. Potgieter, and S. M. Gadd.

The cattle section included a good display of Frieslands (some of which were of exceptional merit), Ayrshires, Afrikanders, Shorthorns, Devons, and Swiss. The leading prizes were taken as under:—Champion Friesland bull, Mr. S. W. Vorster; champion cow, Mrs. C. Vermaak. Champion Ayrshire bull, Mr. R. H. Struben; cow, Mr. W. Allan. Champion Afriander bull, Mr. J. P. du Plessis; cow, Mr. H. Nash Webber. Champion Shorthorn bull, Geo. King & Sons; cow, Mrs. W. Distin. Champion Devon bull and cow, Mr. H. L. Southey. Champion Swiss bull, Messrs. Edwards Bros. Although there was a class for Herefords none were entered. This is rather surprising, as there are some fairly good representatives of this tribe in adjoining districts.

The Merino sheep were another excellent section, the entries being numerous and the competition very keen. In the Tasmanian and allied types the principle winners were C. Adams & Sons, Edwards Bros., F. C. Bayley, and P. J. du Plessis.

In the Rambouillet and allied types the winners were:—Messrs. J. S. Minnaar, D. Mackenzie, B. J. du Plessis, A. Luckhoff, F. W. Kock, and F. C. Bayley. In the unhoused class Messrs. E. T. Gilfillan, J. G. Sieberhagen, F. C. Bayley, A. Luckhoff, Mrs. C. Vermaak, and A. J. Celliers came to the fore. The championship for the best ram in the yard fell to Messrs. Edwards Bros., and for the best ewe to Messrs. C. Adams & Sons.

The Angora section was exceptionally strong, and here again some exceedingly fine animals were in competition. If the Angora industry of the Cape could be judged by the prize animals at such shows one would be inclined to wonder why so much criticism is levelled at South African mohair by the dealers. It is difficult to imagine how finer hair could be produced and the stamina of the animal maintained at the same time. However, these are questions for those interested to solve. The leading prize-winners were:—Messrs. Cawood Bros., R. C. Holmes, R. Cawood, A. B. Hobson, F. C. Bayley, W. G. Hobson, J. E. Hobson, Jno. H. Hobson, Percy E. Hobson, and W. G. Hobson. The championship for rams fell to Cawood Bros., that for ewes going to A. B. Hobson.

But of all these exhibits and sections the finest of all was, undoubtedly, the ostrich feathers. In this section there were fifteen

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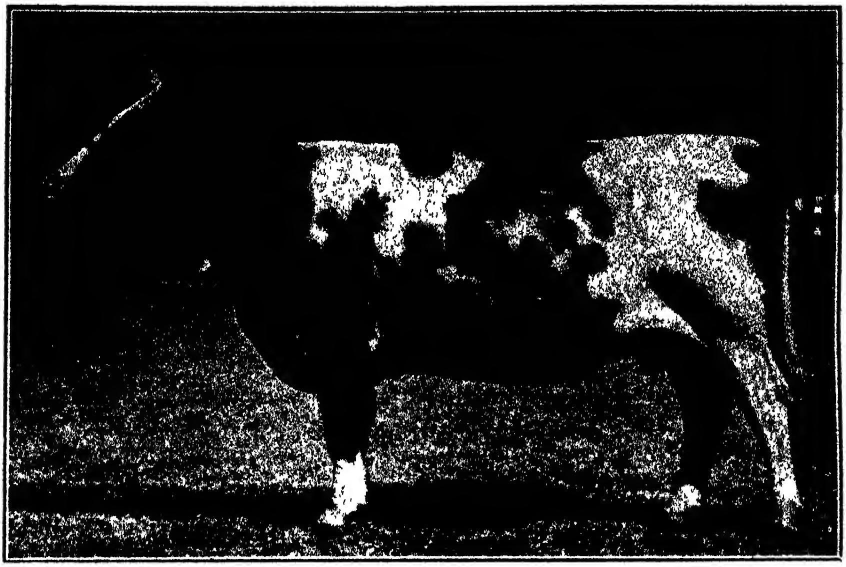


Champion S A. Bred Heifer (Rosebank). Mr. J. Rawbone, Sir Lowry Pass.

Champion S.A. Bred (heavy) Bull; Champion Heavy Bred Bull (Rosebank).
Mr. D. J. Schneider, Lower Paarl.

classes, and they attracted some of the best breeders in the country. The result may be imagined. By some it was described as the very best show of feathers ever seen at competitions of this description. The ostrich plays a very important part in these districts and is entitled to pride of place. He certainly attained that position at Middelburg. The prize-winners were:—W. D. Redelinghuis, Senator C. Southey, W. Rubidge (16 oz. primes); B. E. White, A. J. Fourie, W. Molteno (4 oz. primes); B. E. White, Geo. White (16 oz. feminas); Geo. White, B. E. White, W. Molteno (4 oz. feminas); Alf. White, Geo. White (8 oz. long blacks); Alf. White, B. E. White, Geo. White (8 oz. long drabs); W. D. Redelinghuis, H. v. d. Riet, W. Rubidge (8 oz. cocks' tails): B. E. White, W. Rubidge, Alf. White (8 oz. hens' tails); B. E. White, Geo. White (8 oz. spadonas); Geo White (2 oz. fancy); H. J. Collett, A. Collett, H. W. Collett, and C. Coetzee, jun., v.h.c. (complete plucking, five cocks and five hens); B. E. White, Geo. White (complete plucking, pair of birds); Senator C. Southey, Turnbull Bros. (single feather, prime); Geo. White, B. E. White (single feather, femina).

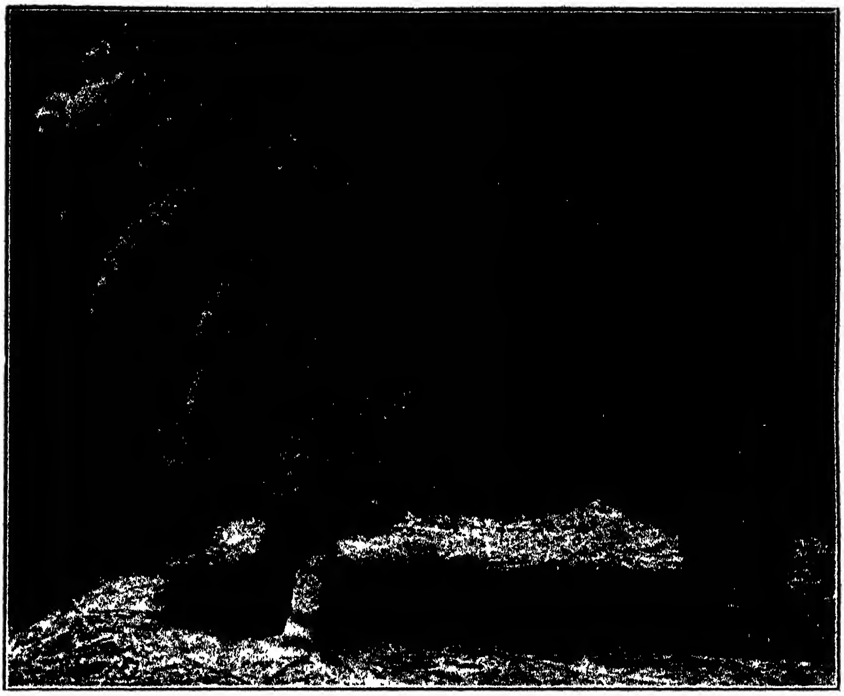
The wool, mohair, and produce sections, generally, were quite good and deserved the attention they evoked. One most attractive feature was a quite nice exhibit of plants and cut flowers. The shed in which these were shown was gay with colour.

For a young society the grounds are in fairly good order, but considering the exceptional conditions it is evident that a great deal of work has yet to be done before the committee can be satisfied. They aim high, and all who visit this show can but wish them every success. It is interesting to note that the entries numbered nearly 2500 this year. As they seem to be going up by leaps and bounds it should be an interesting conjecture as to where they may be likely to stop.

THE CRADOCK SHOW.

Middelburg and Cradock are sister towns of the Cape Midlands. Separated by a train journey of barely three hours, and placed in the middle of a vast expanse of now rolling, now broken, Karoo, they may almost be said to be situated in the same district, so very similar are the farming conditions which obtain in the areas of which they are the respective centres. Live stock raising—ostriches, horses, goats, sheep, and, to some extent, cattle—is the principal form of farming carried on. It was only to be expected, therefore, that, at these two shows, stock should have formed by far the strongest feature. At Cradock, in fact, after stock, there was little else of note.

Cradock boasts quite a respectable show-ground. The main buildings consists of a structure containing a large number of stalls for the horse exhibits on quite up-to-date lines; two long closed sheds for indoor exhibits—produce, fruit, feathers, and so forth—and an open shed for industrial stalls, besides a grandstand. In addition, there are, of course, the usual series of shedded stalls for cattle and small stock. A large oval completes the facilities. Cradock may, in fact, well be congratulated upon its asset of an up-to-date show-ground—small, yet well suited to the requirements of the district. Minor improvements are, perhaps, needed in some directions, but these will probably be forthcoming as experience points to their necessity.



Champion robust-woolled Merino Ewe (Rosebank). Messrs C Adams & Sons, Tarkastad.

Champion robust-woolled Merino Ram (Queenstown, Rosebank, Grahamstown, and Port Elizabeth). Mr. J. H. King, Tarkastad.

To come to the show itself, it would be difficult to say, of the horses and the goats, which section deserved the place of honour of premier excellence in the whole exhibition, though many, perhaps, would be inclined to the latter. In numbers and in quality both were excellent, and were undoubtedly the great feature of the show. In fact, the judge of the goat section, Mr. Sydney Hobson, remarked that he had never had the pleasure of handling a finer lot of goats. Many of the animals that were not awarded prizes were also of a very high class. In the single 2-tooth class the judge had the greatest difficulty in deciding on the prize-winners, and the same remark applies to the single 4-tooth and pen of three 2-tooth exhibits. The fineness, length, and lustre of many of the exhibits was most striking; and the judge considered that breeders were to be complimented on their exhibits as a whole. Mr. Evans, the President of the Agricultural Union, who opened the show, also paid a compliment to the goat section, considering that a better show of Angoras had probably never been brought together. Messrs. Cawood and A. B. Hobson were most successful, securing premier awards in a number of classes with some splendid animals. Messrs. Cawood Bros.' 4-tooth ram, which took "first" in its class and championship, was described by the judge as a very superior goat, having the attributes essential to raising the quality of the mohair of this country. In the class for 2-tooth rams Mr. R. Cawood secured premier honours with a buck sixteen months old—a high-class animal possessing fleece of splendid length, fineness, and density. This animal ran the champion very close.

In the horse section, Mr. Stephen Meintjes secured premier place for imported thoroughbred stallions, with Mr. Hilton Barber second. In other thoroughbred classes Mr. Hilton Barber did well, taking "first" in the classes for imported mares, South African bred mares, South African bred colts, and South African fillies. In the South African bred stallion class Mr. H. J. Collett took premier honours. There was a good show of hackneys, too, in which section Messrs. S. J. Lombard and E. T. Gilfillan secured "first" for imported stallions and imported mares respectively. Mr. H. J. Collett was awarded "first" for his South African bred mare, colt, and filly. Mr. J. F. Erasmus secured "first" in the class for South African bred stallions. Thoroughbreds, hackneys, and Arabs were the only breeds specially provided for in the prize list (draught horses were, of course, considered separately), and the consequence was that all other breeds represented had to be lumped together—a practice which, as was remarked upon in our report of the Beaufort West show last month, considerably discounted the value of the horse section. Some semblance of classification would lead to a more just placing of awards.

Cattle offered a fair show, especially Afrikanders and Frieslands; there were some good Shorthorns, but other classes offered a poor show. Cradock can hardly be described, however, as an ideal district for cattle, and, when this fact is taken into consideration, the show in this particular may be written down a success.

Sheep, strangely enough, were disappointing, being very poor both in number and in quality. Quite a number of animals were shown in the wrong class, too, fine-woolled animals being entered in the robust class. Considering Cradock's situation in the Karoo, a considerably better show in this section might have been expected.

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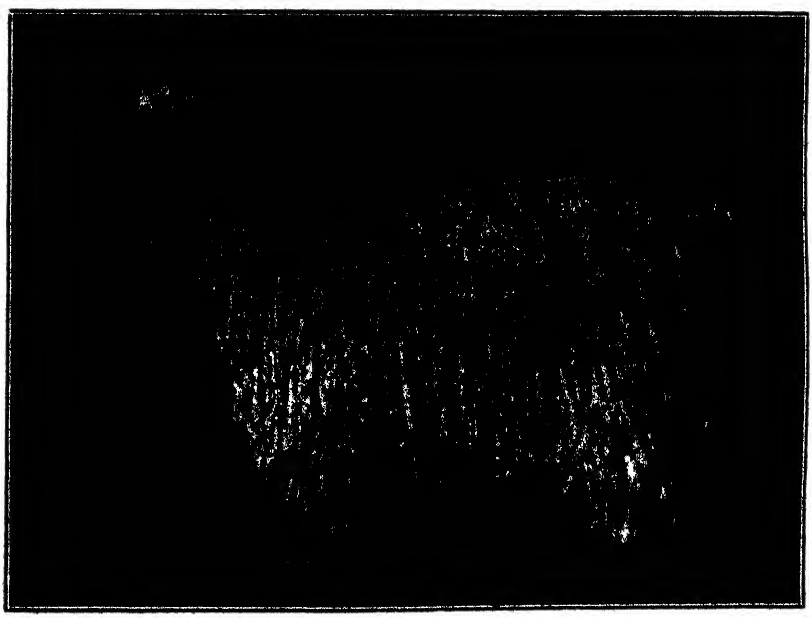
Champion fine-woolled Merino Ram (Britstown. Beaufort West, Rosebank, and Port Elizabeth). Mr. F. C. Bayly, Deelfontein.



Champion Angora Ram (Beaufort West and Rosebank). Mr. F. C. Bayly, Deelfontein.

The wool section, too, was poorly represented; in the seven different classes there were only eight exhibits altogether. The same remarks apply to mohair. There was a fine show of feathers, and competition was keen, especially in the variety and unsorted classes, which gave the judges some trouble in placing the awards. Some very good exhibits of butter were to be seen, the three - best, as well as one or two of the rest, being of very fine flavour and good grain, and with texture showing just the right amount of moisture. The poultry section, though small, showed a great improvement upon last year's show, and there were some good birds to be seen.

There was the usual "field trial", this year the prize being offered for the best dam valve. There were eight entries, and the prize fell to Mr. C. K. Hall (Middelburg, Cape Province) for his all-metal leather-washered valve, which worked easily in opening and closing, was free from splash, and was fitted with padlock arrangement.

On the whole, the show was a very interesting one, though not as fully representative of the district as it might have been, and the society is to be congratulated upon the success which they have this year achieved.

THE ALBANY SHOW AT GRAHAMSTOWN.

Grahamstown was favoured with good weather on the occasion of its annual agricultural show on the 21st and 22nd ultimo, and as the town was more or less holiday-making, for the greater part of the week, there was quite an influx of visitors, and the attendance was well up to the general standard. The surrounding districts were not so well represented among the exhibits as is usually the case in the general produce classes, and as these are very strong as a rule this feature was missed. Even the maize and cereal sections were not what they have been, while vegetables and fruit, always a notable feature, were, comparatively speaking, weak. The stock classes were all well filled, and the quality was high, with the exception of horses, of which the display, particularly in the breeding classes, was not nearly so strong nor nearly so high in quality as the Settlers' City has shown in the past. The wool and mohair sections were not at all strong either, the competition being poor, and there being no entries in several of the wool classes. This is to be regretted, as some of the best wool in the country is turned out of this and the adjoining districts. On the other hand, the display of ostrich feathers was very fine indeed. This was to have been expected, considering the fact that several of the most successful breeders in the world are located in the Albany District, while others are not very far away. The great strides being made by this industry was demonstrated by the variety and quality of the feathers shown, and the really magnificent quality. How the judges could decide between several of the better class competitors was a puzzle to many of the visitors, even to those interested. The possible developments were also indicated by one of the finest displays of juvenal feathers—colloquially known as "first after chicks"—ever shown. This was put on by Mr. Alf. White, a famous breeder, and consisted of bunches and bunches of splendid plumes, mostly of high quality, plucked from young birds raised on rape on a farm near the coast. Judging by such an exhibition it would seem that the coastal sections of the south-eastern districts of the Cape Province may yet rival the older established ostrich sections

in the drier parts of the country. The new showground of this society is gradually being improved and equipped to meet the ever-growing demands for space, and this year more loose boxes were provided and better accommodation for cattle and horses. This advance, it is to be hoped, will continue, for the Albany showground is very picturesquely situated, and should in time rank among the most attractive of the many attractive features of Grahamstown. The expansion of accommodation has, of course, its utilitarian side as well, for it enables the exhibits to be shown to greater advantage. This applies to the implement space particularly, for it is doubtful if Grahamstown has seen a better display than that shown this year. And everything was sound and satisfactory, while some inplements most suited to local conditions and comparatively new to these parts were to be found there. Notably the ditchers and graders for the efficient and economical working and levelling of irrigable lands, implements which have successfully solved some of the problems of the irrigator in the United States, attracted a good deal of attention. It is a pity these could not have been shown at work, but the exigencies of space prohibited this. These were shown by Messrs. C. J. Stirk & Son, of Grahamstown, and one of them, the "Glide" grader and land leveller, was awarded a special prize of £10 at the Middelburg Field Trials this year. At that competition it was, of course, tested in actual operation.

Another feature which has not for some time formed a very prominent part of agricultural shows was a large exhibit of ostriches. In these classes the entries were plentiful and competition quite good.

In the wool section the prize for 500 lb. of grass-veld grease was taken by Dennison Clarke, of Highlands, A. W. Munro, of Slaai Kraal, being second, these being the only competitors. There were three entries for grass-veld hoggets, the first prize going to F. C. G. Palmer, the second to A. W. Munro. T. T. Hoole, of Atherstone, was awarded first for the best ten fleeces of grass-veld grease, Dennison Clarke being second. No Karroo wool was shown. In mohair, R. C. Holmes, of Kendrew, and F. G. Theophilus were first and second.

The competition in the ostrich feathers resulted in Alf. White coming out first in the class for best variety (not less than 36 oz., consisting of 12 varieties of 3 oz. each) against some of the most notable breeders in the country; first in long blacks and second in long drabs. B. E. White, of Fish River, was second in the variety class and feminas; W. Rubidge, Graaff-Reinet, was first for white primes (1 lb. weight), second for white tails and femina tails, while G. White was first for feminas, spadonas, and long drabs. W. D. Redelinghuys, of Oudtshoorn, was first for white tails, and O. E. G. Evans first for long mottled blacks. This competition, following the tussle at Middelburg, and immediately preceding the big contest at Port Elizabeth, evoked the keenest interest.

The Merino sheep section was quite good, and there was plenty of interest shown in it. The same may be said of the Angora goats, the uniform fine quality of the latter being particularly noticeable. It is very evident that the mohair producers are doing their best in their stud flocks to put out animals with an increasing fineness of fleece. The fine-woolled champion Merino ram was found in T. T. Hoole's imported representative, and the robust-woolled championship was awarded to Mr. J. H. King, the same sheep having been awarded championship honours at Queenstown and Rosebank this

year. C. Adams & Son took both championships for ewes. The Angora championship for rams was awarded to R. C. Holmes, and for ewes to A. B. Hobson.

The cattle section was not so strong as usual, many of the classes being left blank. This may probably be accounted for by the uneasiness caused generally along the coastal belt by the onset of tick fever further east. There were some good specimens of shorthorns and Frieslands, one of the latter, a bull shown by Bartlett Bros., of Cathcart, being awarded the championship of the yard.

Pigs were few; quality fairly good. Poultry was a good section, and the general classes, such as local manufactures, were also satisfactory.

In fact, taken altogether, the show was successful considering the bad season, the threatened onset of cattle fever, and other drawbacks, and the society is to be congratulated on its courage and confidence in holding to the fixture.

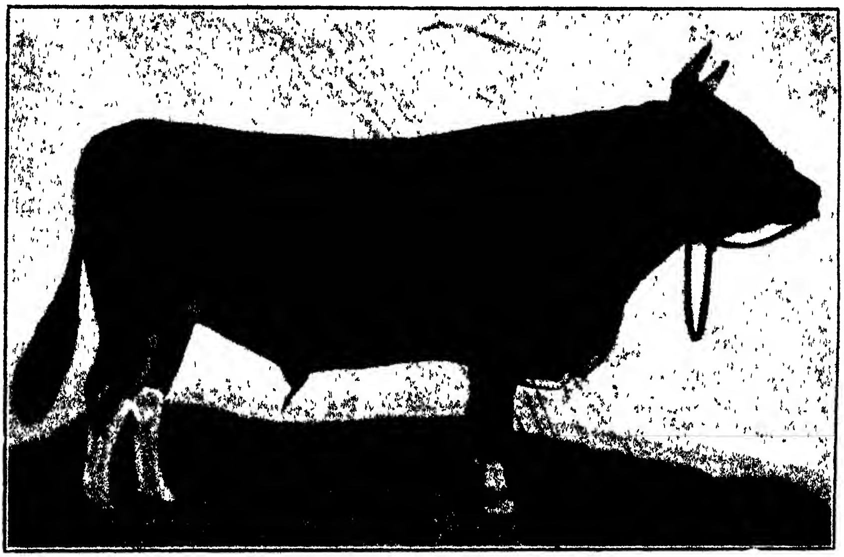
THE PORT ELIZABETH SHOW.

The Port Elizabeth Agricultural Show, being among the oldest in South Africa, has reached the classic stage. The society can always depend upon the whole-hearted support of the community, and the showground supported that conclusion, with the one exception of the horse section. In this section there was a marked absence of the strong array of Thoroughbreds and Hackneys for which this show has been noted in the past. In fact, many of the classes under these divisions were devoid of entrants, while in nearly all the competition was very limited. Why this should be is difficult to understand, and it has to be admitted that all the evidence found in the magnificent result is that year by year one scarcely hears of anything but records. It would appear that this year all previous efforts have been surpassed, except on the supposition that Bloemfontein and Johannesburg are proving more attractive to the breeders of these types. The paucity of entries in these classes is to be regretted, as they should form one of the most valuable features of so important a fixture. The Thoroughbred stallions included J. B. McDonald's "Mago Pico" and S. Meintjes' "Stormbound", while R. H. Struben showed "Fortunatus" among the colts. The open class for Hackney stallions included R. Morton's "Lord Ossington" and P. H. van Rooyen's "Scotland's Crest", while there was a fair sprinkling of young stock of both sexes. There were also a few Arabs, among these being three stallions. The general classes, the remounts, and the riding and driving sections were very well filled, and the competition was quite good, the quality being fairly even. The ladies' classes were also well filled. The donkeys were a fairly good lot, but there was only one pair of mules.

Among the stock the strong sections were the cattle, sheep, and Angora goats. The most interesting section from the industrial point of view was the cattle. It is doubtful if Port Elizabeth has ever seen anything to approach the display put forward this year either in numbers, quality, or variety of breeds. The most numerous among the tribes represented were the Shorthorns and Frieslands, and as there were some excellent types in both, the exhibit as a whole was really strong. Afrikanders were well represented, some of the youngsters being particularly attractive. The Hereford classes

brought no competitors, but there was a very strong show of Ayrshires, mostly from the well-known Broadlands herd of J. Rawbone. The only other exhibitors in fact were O. C. M. Barry, with "Montrose Klass" (the South African bred bull that took the championship, repeating his performance at Rosebank), and R. H. Struben, who had two young bulls. The bulk of the prizes went to the Broadlands group. A good lot of Devons were shown by H. L. Southey, and as he had these classes to himself the prizes all fell to his representatives.

In the Shorthorn section the championship fell to "Masquerader", a bull belonging to Geo. King & Sons, the champion cow being found in one of Mrs. Distin's exhibits. "Masquerader" is well known as a prize-winner. "Burton Red", a young Lincoln bull, the property of J. Martin & Co., was placed as reserve champion.



Champion Ayrshire Bull (light breed) · Champion Bull, S.A. Bred (light breed).
Champion at Stellenbosch, Rosebank, and Port Elizabeth.
Mr. O. C. M. Barry, Stellenbosch.

Among the other successful competitors were A. A. Hockly & Son and W. H. Weeks & Son, who had some excellent animals competing.

In the Frieslands the championship for bulls went to T. C. White, of Grahamstown. This bull competed at Grahamstown, but was there set aside for an older animal shown by Bartlett Bros., which here was in turn superseded.

There was great competition in the Merino sheep section, and as fine a display as the most exacting could wish. With half a dozen championships there was plenty to interest the spectator. It is more than doubtful if this country has ever seen a finer show of woolled sheep both as regards numbers and quality. There was evidence here of the great strides this industry is making, for in each of the divisions of the section the same high standard of excellence was to be seen. Among the fine-woolled Tasmanian and allied groups, F. C. Bayly

again came first with the ram that was given championship honours at Beaufort West, Britstown, and Rosebank, while the robust-woolled championship fell to J. H. King's ram that has carried off similar honours this year at Queenstown, Rosebank, and Grahamstown. F. W. Southey scored champion honours for both fine and robust woolled ewes, C. Adams & Son taking the Gladstone Cup for the group class.

The most interesting division to a very large number of the visitors was the Rambouillet and allied types. Here were shown some splendid specimens of that exceedingly useful type of sheep, including some Wanganellas. The pick of the whole section was, however, a magnificent ram shown by J. S. Minnaar, of the Graaff-Reinet District, which took the robust championship. This sheep was the observed of all observers, and took championship honours at both Graaff-Reinet and Middelburg this year. He is a magnificent animal and comes from a Wanganella ram through an old-established South African flock. A. Luckhoff, another Graaff-Reinet breeder took the championship for ewes. The plain-bodied sheep were also an excellent exhibit, especially the ewes, as also were the unhoused section.

The Angora goats were another great exhibit both as to numbers and consistently maintained quality. All the classes were filled, some to overflowing, and the competition was sufficiently keen to satisfy the most exacting. The final struggle for the championship placed the laurel on a well-developed ram belonging to R. C. Holmes, who took the first prize at Grahamstown, but with a very different animal. Different judges different opinions, evidently. A. B. Hobson was awarded the championship for ewes, also the winner at Grahamstown. The excellent quality of the whole of the exhibits in this section left very little to cavil at, and the stud breeders are to be heartily congratulated on the rapid strides they are taking towards establishing the finer types of mohair to meet the demands of the trade, though we have still a long way to go before the producing flocks of the country can be placed on the same level.

Middelburg and Grahamstown put up grand shows of ostrich feathers, but neither quite equalled the really magnificent display at Port Elizabeth. There were some differences, too, in the judgments. The special champion cup for the best entire plucking from twenty birds was taken by John Meiring, G. White being second. The prize for the best variety, not less than 5 lb. in all, was taken by O. E. G. Evans, with Alf. White second. Best pluckings of ten birds, unsorted, fell to J. Alec. Collett, with G. White second. First after chicks, ten birds, G. White first, J. H. le Roux second. C. Southey was first for primes, W. Molteno second. Feminas, G. White first, B. E. White second. Spadonas, F. H. Holland first, G. White second. Long blacks, O. E. G. Evans first, Alf. White second. Long drabs, G. White first, Alf. White second. White tails, W. Redelinghuys first, W. Rubidge second. Fancies, O. E. G. Evans first, Barratt & Stockdale second. Long mottled blacks, G. White first, Alf. White second. Femina tails, B. E. White first, J. O. Gardner & Sons second.

Wool and mohair might easily have been better represented than they were considering the value of the prizes offered. The only point in the favour of this section was the fact that it was the best seen this show-season. The quality was fairly sound all round and

in some cases excellent. The prize for Karroo grease in bulk fell to R. Rubidge; for grass-veld grease to Dennison Clarke; that for mixed veld went to Geo. King & Sons. Karroo-grown hoggetts grease was taken by W. Rubidge; grass veld by H. A. Pietersen, A. Munro being second; while the mixed veld honours fell to E. J. Niland. W. J. Rippon secured first for lambs, and Gubb & Inggs that for scoured wool with an excellent exhibit. Three special prizes were offered for fleeces, to be judged mostly on their merits with a particular eye to commercial returns. The first of these, £10 offered by A. Mosenthal & Co., was secured by A. Luckhoff, G. A. Whitehead coming second. This was for ten fleeces of twelve-months' growth nine of which were scoured and judged on the clean-wool basis and exhibited alongside the unscoured fleece. The second of these was £5 offered by R. Rubidge, for ten fleeces from sheep bred by the exhibitor, to be judged in the grease on the quality of the wool regardless of shrinkage. This was taken by Dennison Clarke, G. A. Whitehead being second. The third was also a £5 prize, offered by Walter Rubidge on practically the same terms as the second. This was taken by Dennison Clarke, R. Rubidge being second.

The machinery and implements, always the finest and most modern to be seen in South Africa, were quite equal to any former exhibit. When it is stated that it takes hours to go through this portion of the Port Elizabeth show, if one wishes to realize in detail the wonderful variety and soundness of this section, some idea will be gained of the number of engines, power-plants, and implements of all descriptions which are displayed. The most interesting feature to any one interested in the development of our agricultural industries is the very evident desire of the merchants and engineers to secure implements most suited to South African conditions and at the same time of the soundest and most reliable types. Among a great deal that was, of course, more or less familiar, there was a good deal that was comparatively new and most interesting. Among the latter were several specially designed shearing plants in full swing, and judging from the numbers of interested spectators it may be concluded that machine-shearing has come to stay.

Among the new features of the showyard has to be mentioned a well-arranged and roomy lecture hall, in which a series of interesting lectures were delivered each day by recognized authorities. These proved very popular, more particularly as the hall is so arranged as to allow of practical demonstrations.

All the other sections of a lengthy and well-arranged prize-list were fairly well filled, and the show, taken altogether, was undoubtedly one of the most successful this old-established society has to its credit.

SHOWS IN THE TRANSVAAL.

MIDDELBURG (TRANSVAAL) SHOW.

The show season of the Transvaal opened on the 7th of February with the Middelburg Agricultural Society's show. Unhappily it rained practically the whole day, which accounts for the small number of visitors. Also the number of entries was small, and

although some classes were very poorly represented a distinct improvement was noticeable compared with former years.

The merino section was much better represented than at the last show, especially as regards lambs and young animals, and that is a step in the right direction.

Tasmanians were well represented, but Rambouillets and Spanish merinos were rather poor, especially the lambs.

The cattle section was much better than last year, and some nice Afrikanders and Ayrshires were to be seen.

Amongst the horses Mr. G. H. Herold's stallion, bred in South Africa, was the best, and Mr. P. A. Morkel showed some splendid teams of mules.

The entries in the produce section were very few in number but of excellent quality. In several classes there were no entries at all, which is greatly to be regretted, as nearly any produce can be grown in this district. Especially the mealie entries were totally inadequate—there was only one entry for all the classes. The early date of the show is no excuse, as the farmers can easily keep a few ears and a small quantity of their best mealies from the last season for exhibition purposes.

Although this show cannot be called a success in every respect it was an improvement on last year's show, and it is to be hoped that the energetic and hard-working committee and secretary will have more support from the farmers of the district next year.

ERMELO SHOW.

The local agricultural show was opened on the 15th of February by the Hon. A. G. Robertson, Chairman of the Provincial Council. It was an excellent show and a great improvement on last year. The cattle, sheep, and horse sections were well represented, also the produce section, notwithstanding the bad season. There were some excellent wheat exhibits, amongst which Mr. S. J. Scheepers' and Mr. Smit's exhibits took the first prizes respectively.

There was a good display of wool; for instance, 200 lb. merino wool, belonging to Mr. J. R. Bührmann, fetched the first prize. This gentleman took most prizes in this section, while Mr. C. J. Broodryk won a first and a second prize for the best lambs' wool.

As regards sheep the prizes were divided between Messrs. Robertson and J. R. Bührmann.

The cattle exhibits included beautiful specimens of Afrikanders, Frieslands, Shorthorns, Devons, Aberdeen Angus, etc. The prizewinners were Mr. Bührmann for the best Afrikander bull, Mr. Steenkamp for the best Afrikander cow, Mr. Bührmann for the best Friesland bull, imported, and Mr. J. D. Breytenbach for the best Friesland bull, bred in South Africa.

Eight wagons, each inspanned with twelve oxen, were very much admired.

The horse section was not so well represented as last year. The principal winners were Messrs. Smit & Uys and Mr. Karel Rood, jun.

Agricultural machinery and implements were exhibited by Messrs. Henwood, Son, Soutter & Co., T. W. Beckett & Co., and G. North & Sons, also some pumps from Stewart & Lloyds, and a splendid disk-plough from Wm. Bain & Co.

The show was attended by hundreds of farmers from the Ermelo and other districts and proved a great success, thanks to the endeavours of Mr. Coetzee, the assiduous secretary.

BETHAL SHOW.

The fourth annual show of the Bethal Agricultural Society was held on the 22nd of February and opened by the Hon. J. Rissik, Administrator of the Transvaal.

A great number of visitors from the Bethal and adjoining districts were present, and the show again proved of what the high veld is capable. There were more than a thousand entries, and they showed a great improvement on last year's exhibits.

Cattle were well represented, especially Frieslands, Afrikanders, and Ayrshires. Shorthorns, however, were weak. Amongst the Afrikander cattle those of Mr. R. E. Erasmus attracted special attention. Exhibitors of Friesland cattle included General Beyers, Messrs. S. E. Watles, Durr, Barnard, and M. C. Adendorff. The champion prize for the best Friesland bull went to General Beyers, whilst Messrs. Durr and Barnard won the champion prize and first prize respectively for the best Friesland cows. The principal exhibitors of Ayrshires were Messrs. A. Wilmot and Marren, who took several prizes. All the animals were in excellent condition, which shows how well the Bethal District is suited for stock-breeding.

The sheep section was excellent in every respect and there was a keen competition between Messrs. R. & V. Robertson and Mr. J. J. Wessels, of the farm Eldorado, District Vrede, Orange Free State. Messrs. Robertson were awarded two first, three second, and three champion prizes, and sold one of their rams on the show-ground for £100. Mr. J. J. Wessels, who was their sharp competitor in this section, fetched the first and one champion prize for a ewe, and one first prize for a ram. The total of prizes awarded to this enterprising sheep farmer of the Orange Free State in this section was three firsts, seven seconds, and one champion prize. Some first-class Wanganellas were exhibited by Mr. Donaldson.

Some beautiful horses were to be seen, amongst which the stallion of Mr. Marren stood out prominently. The young horses, bred in the district, were excellent.

The produce section was rather weak.

Some excellent machinery and implements were exhibited by the firms Henwood, Son, Soutter & Co., North, and Malcomess & Co.

AMERSFOORT SHOW.

On the 27th of February the Amersfoort Agricultural Society held its third annual show.

It was opened by the Administrator, the Hon. J. Rissik, who congratulated the district on the progress it had made since he had been there last.

The outstanding feature of the show was the horse section, a really splendid exhibition in all classes. The judges for these classes had a very hard time; although it was a one-day show the judging could not be finished, and had to be completed the next day.

Cattle were rather poor; there were a few entries of most of the leading breeds, such as Frieslands, Afrikanders, Devons, Shorthorns, and Ayrshires. This district, being perfectly adapted for

cattle breeding, it is to be hoped, and it certainly may be expected, that next year's exhibition will show considerable improvement in this section. There was already a certain improvement noticeable compared with last year.

Another remarkable particularity of the show was the weakness of the sheep and wool sections. There was not a single wool entry, and only a few sheep entries. Those sheep that were exhibited were, however, good specimens, and Messrs. Robertson Bros. showed some splendid sheep for exhibition only.

Poultry entries were few, but of excellent quality. The same may be said of the produce exhibits, Mr. F. le Roux, the well-known produce grower, carrying away most prizes in this section.

Dairy produce was rather disappointing in quality, but it seems the Amersfoort ladies take a great interest in the industry. Mr. Veenstra, the Government official, who judged this exhibition, was busy the whole afternoon answering questions, and he had to promise that either he or another Government official would tour the district at an early date in order to give demonstrations in butter and cheese making.

THE HEIDELBERG SHOW.

The Heidelberg Agricultural Society held its sixth annual show on the 27th and 28th March in favourable weather, with the exception of a little rain that fell on the morning of the first day.

The society possesses quite a respectable little showground, situated between two and three miles from the town. Although the buildings are not, perhaps, as substantial as are to be found in larger centres, they nevertheless serve their purpose and are quite sufficient for the needs of the society's exhibitors.

One of the great features of the show was undoubtedly the horse section, which, both in numbers and quality, did great credit to the society and the district. This section, indeed, was as good as is to be seen at many larger shows.

Cattle presented a fair show as regards numbers, and some good animals were to be seen, particularly in the bull classes.

Sheep also were good, though the section was not too well patronized. The goat section was not as good as might have been expected. Pigs were excellent on the whole, the section including some fine animals.

The show of poultry was an astonishingly good one, and in many of the classes the judge had his work cut out to decide upon the prize-winners. In most classes there were some really excellent birds to be seen, and the society is to be congratulated upon the great success of this feature of their show.

The produce hall presented a good show of farm products; some of them hailing from as far south as Volksrust. Wheat and miscellaneous pasture grasses showed up particularly well, while there were some good samples of mealies and other grains. Mr. F. le Roux, of Volksrust, deserves mention for his splendid collection of farm produce, grown both under irrigation and on "dry" lands. This exhibit included wheat (9 varieties), barley (4 varieties), oats (3 varieties), peas (2 varieties), beans (4 varieties), maize (4 varieties), burnet, birdseed, Japanese millet, spelt, buckwheat, rye, linseed, kaffir corn, boer meal (2), mealie-meal (2), crushed mealies, split peas,

bran, and 14 varieties of grasses (including burnet, tall fescue, teff, veld-hay, etc.). Mr. Le Roux did very well indeed in the produce classes, securing ten "firsts", ten "seconds", and three "h.c.'s".

There was a fair amount of agricultural machinery on the show, but it suffered from the disadvantage of being too scattered, so that it did not show up as well as it would otherwise have done.

Notes.

East Coast Fever Inoculation in the Transkei.

An interesting report upon the progress of inoculation for East Coast fever in the Transkei has been received from Senior Veterinary Officer Spreull, Umtata. Mr. Spreull states that the Districts of Umtata, Libode, Ngqeleni, Willowvale, Idutywa, Engcobo, Tsolo, Mqanduli, and St. John's are all losing heavily from East Coast fever, and are raising an ever more insistent demand for inoculation. The natives are now prepared to take any risks which the method involves. Government Veterinary Officer Jones inoculated over 3000 cattle in January, chiefly in Mqanduli District; once settled down at a centre he can scarcely get away from it, the demands for his services are so heavy. Government Veterinary Officer Chambers, having completed the inoculation of the transport on the Umtata-St. Johns route, turned his attention to Ngqeleni District. Here probably 20,000 were awaiting inoculation at the date of the report (9th February), and required it at once. Nearly 1000 cattle were inoculated in December by Government Veterinary Officer Jones in Tsolo District, one location only being concerned; others were waiting for inoculation. Inoculation kraals have been erected, one in Mqanduli District, one in Ngqeleni, one at Zimbane (Umtata), and one on Limbode outspan. Another has been purchased at Gongululu, Tsolo. The Umtata-St. Johns road was closed on 20th December in order to get the transport cattle all inoculated. It was opened again for inoculated (and tested) oxen at the end of the month. In spite of the fact that all the outspans were infected along the Umtata-Munyu route, the oxen on a seven-day dipping (not spraying) remained healthy at the beginning of February.

Raisin Grading.

The following is a copy of a report which has been received by the Acting Secretary for Agriculture from Mr. S. W. van Niekerk, on behalf of the Raisin-grading Commission appointed last year. The commission consisted of Messrs. P J. Cillie (C.'s son), D. de Vos Rabia, and J. P. Malan. "The gentlemen", Mr. Van Niekerk, reports, "met at Worcester on the 10th May, 1911. It soon appeared that, with regard to raisin grading, nothing could be done at the present moment. It was found that the Worcester produce merchants were against the grading of raisins this year, although they admitted we were taking a step in the right direction. The principle was unanimously adopted at a meeting of the Worcester Chamber of Commerce. The merchants argued that it was too late for them to accept standard grades now, since they had sold 'for future delivery' large quantities of their stock in hand, according to individual grades, and if the commission were now to fix another it would upset their future sales. The merchants advised that the commission should fix

the grades at the beginning of the raisin season, so as to enable them to buy accordingly. There was, therefore, for the commission only one alternative, and that was to leave the grading for this season. with the recommendation that meetings should be held of both the produce merchants and the farmers, at an early date next season, so as to come to a clear understanding about the fixing of the grades."

The following is the resolution which was passed by the Worcester Chamber of Commerce referred to in the foregoing:—The President proposed: "The Government be invited to send their experts to the different raisin-curing districts to teach the farmers how to make raisins in a proper manner, and to prohibit the use of caustic soda; and that raisins should be made in three grades, as suggested by the Raisin-grading Commission, and should the suggestions of the Chamber be carried out this Chamber (especially the produce section) will endeavour to co-operate by giving different prices for the different grades, and to discourage the making of lower grade raisins by refusing to buy them." The motion was seconded by Mr. C. J. de Kock, and was carried unanimously.

Export of Grass and Hay to Mozambique.

Produce merchants and others interested are warned that no produce packed in grass or grass hay will be admitted into the Province of Mozambique unless accompanied by a sworn declaration by the sender, or by a certificate signed by a Government veterinary surgeon, stock inspector, or magistrate, to the effect that the grass or hay does not come from an area infected with East Coast fever.

Tobacco Culture.

In reply to a correspondent, who asks for some information in connection with the growing and preparation of tobacco, the Chief of the Division of Tobacco and Cotton furnishes the following memorandum:—For the production of cigarette tobacco, light in colour, the plants should stand on the land until the leaf takes on a greenish-yellow colour. For pipe tobacco the plants should be larger and be of a dark green colour. These plants should be left in the field until the leaf becomes somewhat brittle and shows numerous flecks of yellow. Ripe tobacco suitable for the pipe also has a rough, granular touch.

After harvesting, the tobacco should hang in the curing shed until thoroughly dry. After the leaf is thoroughly dry it should be taken down when pliable and graded into the several grades and then baled for a few months to allow the tobacco to age. After aging, the bales are broken open and the tobacco slightly moistened with a "Fog" spray pump, when it is placed in bulk for fermentation. A thermometer is placed in the bulk, and should be watched to see that the temperature in the bulk does not rise too high. When the thermometer registers 120° F., the bulk should be broken down and the tobacco rebulked. When the temperature reaches 115° F., the bulk should be broken again and rebuilt. This operation should be continued, decreasing the temperature by 5° F. each time the bulk is broken, until the bulk reaches the normal temperature of the atmosphere, when the fermentation process will be completed.

When tobacco is to be prepared for pipe-smoking, it is fermented as follows:—The dry tobacco is immersed in clean water and allowed to drain slightly, when it is placed in a bulk. The tobacco remains in the bulk for about twenty-four hours, or sometimes longer, and is then put through the cutting machine. After being cut the tobacco is placed in a heap and allowed to ferment for about twenty-four hours, when it is turned to cool, and is then again placed in a heap. After another twenty-four hours the tobacco is spread evenly on a bucksail and allowed to dry either in the shade or in the sun. When dried in the shade the tobacco is supposed to be stronger.

Supply of Indigo Seed.

A letter has been received from the Government Botanist from a correspondent residing in Scotland, who is interested in the indigo industry in India, and who is anxious to get into touch with a reliable person who would be prepared to send an annual supply of this seed to India. Their annual requirements would be about two tons of seed. The supply would have to be carefully selected seed, free from soil and grit, thoroughly dried, and packed in hermetically sealed tins. A quotation on the above lines c.i.f. Calcutta is asked. If any readers are in a position to supply indigo seed perhaps they would be good enough to communicate with the Government Botanist, Department of Agriculture, Pretoria.

Messrs. Starke & Co.'s Seed Catalogue.

Messrs. C. Starke & Co., Ltd., of Mowbray, Cape Province, have just issued their new seed catalogue for 1912. The catalogue contains a good deal of information concerning the different kinds of seeds offered, and is generally well up to the standard of previous catalogues. Readers desiring copies may obtain same on application to Messrs. Starke & Co.

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

GRAZING CALVES.

To the EDITOR of the *Agricultural Journal*.

SIR,—In the *Agricultural Journal* of January, 1912, a question appears under the heading, "Grazing Calves", from H. T. K., Wakkerstroom, together with an answer from the General Manager of the Experiment Farm, Potchefstroom.

The manager of the above farm states in his answer plainly, that calves under four or five months old should not be fed with coarse dry fodder. I beg to differ with the manager in that respect, as my experiment in cattle farming has proved different.

I have lost hundreds of calves by all kinds of diseases, especially "dronk galsick", by letting them out for grazing on the grass or green stuff, four months old, younger or older, while sucking. At last I decided to feed my calves with coarse dry straw from the tramp floor, and the result is that I have reared every calf since they are fed till I wean them from their mothers.

I water them once a week, early in the morning, just before milking-time.—Yours, etc.

S. C. VAN ROOYEN.

Alexandria, C.P., 2nd February, 1912.

[The above letter was referred to the General Manager of the Experiment Farm at Potchefstroom, who furnishes the following note: —I am glad to notice that Mr. Van Rooyen was interested in my reply to H. T. K., Wakkerstroom. I cannot persuade myself to conclude that the mortality among Mr. Van Rooyen's calves ceased because they were fed on coarse dry straw. There must, I think, be some contributory cause, or it is mere coincidence. For the same reasons that babies should not be reared on the food of adults, young calves should not be fed on coarse dry fodder.]

CHROME LEATHER.

To the EDITOR of the *Agricultural Journal*.

SIR,—In reply to "Raw Sole" (Vol. III, No. 3), chrome leather is made by treating hides with inorganic instead of organic materials. There are two processes in common use, both of which are often much modified, e.g. to include dyeing at the same time.

In the one-bath process, the hides are usually treated with solutions of basic chromium sulphate and chromium oxy-chloride. In the other process the hides are first soaked in a solution of potassium bichromate acidified with hydrochloric acid, and then in a second bath, sodium thiosulphate and HCl are added.

The tannage is subsequently fixed with lead acetate or some other suitable salt. The leather is finally washed, dried, and stretched, then greased with a warm benzine solution of paraffin.

The great advantages of chrome leather, and the high prices asked for it locally, are well known.—Yours, etc.,

BERNARD W. HOLMAN,

Heymann's Laboratory,
Johannesburg, 19th March.

JIBBING HORSES.

To the EDITOR of the *Agricultural Journal.*

SIR,—A pair of jibbing horses can be cured by keeping them standing for twenty-four hours after they have refused to pull. They are to receive no food or water. After standing a few hours they will want to move off, but if allowed to do so before the time the treatment will not be of any use. They will seldom require to be kept waiting the second time, but in case they do, it would be well to administer the cure only when time permits. After having kept them waiting, drive them a mile or two, then feed and water them.—Yours, etc.,

W. FLOWERS.

Umga Flats, via Ugie, 18th March.

POISONING BABOONS AND MONKEYS.

To the EDITOR of the *Agricultural Journal.*

SIR,—Can you, or any of your numerous readers, inform me through the medium of your *Journal*, which is the best and most effective way of killing or poisoning baboons and monkeys ?

Those brutes are a terrible curse to farmers in these parts—baboons in particular. They are not only responsible for unnecessary labour and loss to the farmer by removing stones at the bottom of wire-netting fences (in search of scorpions, etc.), thus enabling the jackal to get to the flocks, but during the prickly-pear season they roam about in troops, with the result that the eradication of prickly-pears is a standing item on the farmers' programme.—Yours, etc.,

B. J. v. A.

Bedford Dist., C.P.,
11th March.

THE LABORATORY DIP.

To the EDITOR of the *Agricultural Journal.*

SIR,—In your issue of February, 1912, on page 285 Mr. Scott, Wakeford asks if it would be possible to give an estimate of what the probable cost of dipping would amount to per month for 100 cattle, allowing same to be dipped every three days, having due regard to liquid absorbed and repletion of same to keep the dip at its ascribed strength.

Mr. Scott Wakeford's inquiry refers to the Natal Laboratory dip, Col. Watkins-Pitchford's formula. In reply, I have pleasure in giving the following information :—

Composition of Laboratory Dip.

4 lb. of Arsenite of soda (80 per cent.).........	For three-day dip.
3 lb. of Soft soap............................	
1 gallon of Paraffin...........................	

The above are the ingredients necessary to make 400 gallons—a 400-gallon tank generally being used for mixing it in. The cost of 4000 gallons of this dip works out as follows :—

	£	s.	d.
40 lb. Arsenite of soda (80 per cent.)..................	0	14	3
30 lb. Soft soap..	0	9	9
10 gallons Paraffin.....................................	0	10	0
	£1	14	0
= 8s. 6d. per 1000 gallons.			

It follows, therefore, that the cost of 3200 gallons (the quantity mentioned by Mr. Scott Wakeford) works out at £1. 6s. 4d.

These are Natal coast prices as quoted by P. Henwood, Son, Soutter & Co., Maritzburg and Durban, who are also the distributing agents for Dr. Watkins-Pitchford's patent isometer for testing the arsenical strength of cattle and sheep dip.

Col. Watkins-Pitchford has ascertained by careful tests that a beast carries away half to three-quarters of a gallon of fluid after each dipping, ample time being allowed for drainage. Therefore let us say that 100 beasts will carry away 75 gallons at each dipping, and if the dipping be done every fourth day—call it seven dippings per month—therefore $7 \times 75 = 525$ gallons per month ; the value of the dip lost would therefore be, at 8s. 6d. per 1000 gallons, 4s. 5½d. per month per 100 cattle.

Cattle-dipping tanks are usually emptied, cleansed, and refilled once in six months.

The above calculation does not take into account the loss by evaporation. The value cannot be serious, but the danger of increased percentage of arsenic may become vital,

this can now be guarded against by using the isometer before each dipping, which at once gives warning that the dip is too strong or, on the other hand, too weak to be effective in killing ticks.—Yours, etc.,

J. T. TAYLOR.

Balgowan, Natal, 24th March, 1912.

TANNING SKINS.

To the EDITOR of the *Agricultural Journal.*

SIR,—In reply to the inquiry *re* tanning skins by "Kuip", the following is a recipe which I have found very useful for tanning skins for mats, sofa rugs, etc. :—

Make a strong lather with hot water and soap—but use it when cold—and wash the fresh skin, being careful if it is a sheep skin to get all the dirt out from the wool. It is best to plunge the skin right into the lather. After well washing in the lather, wash it clean in cold water. Dissolve 1 lb. each of salt and alum in 2 gallons of hot water (of course, if skin be very large it may take more, but that is the proportion of the mixture). Soak the skin in it for twelve hours; hang it on a pole, flesh inwards, to drain. When well drained, stretch it upon a floor or board to dry—stretch it several times during the process of drying (I nail it fur downwards with wire nails, so that air can pass underneath). Before it is quite dry, sprinkle it on the flesh side with 1 ounce each of powdered alum and saltpetre and rub it well in. If the fur or wool is then found to be firm on the skin, it can be folded up and allowed to dry thoroughly, turning it over from day to day: then scrape the flesh side with a blunt knife and rub it with pumice stone or fine sandpaper.

I have found the above receipt most excellent for sheep, goat, small buck, and small animal skins, also for young calf skins and very young foal skins. For larger buck and animal skins, I found it better to soak the skin a bit longer in the salt and alum.—Yours, etc.,

EUSTACE S. BUTTERMER.

Good Hope, Swinburne Station, O.F.S.,
22nd March.

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal*. In all cases replies will be posted to correspondents so soon as same have been procured.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

CLYDESDALES.

A. W. Ranoldt, P.O. Olivewood, Colesberg, C.P., writes :—I intend to go in for a heavy horse as draft animal for working any lands, after the Government's example at the experiment farms. You would oblige me exceedingly by giving some details as to their ability to work lands for lucerne, feeding, etc., and price of Clydesdale mares ; also whether Government is prepared to sell any or where else obtainable.

Answer.—The General Manager of the Experiment Farm, Potchefstroom, replied :—Clydesdale mares are exceedingly useful on cropping farms where a good deal of mowing, reaping, planting, seeding, and so forth have to be done. In the climatic conditions of South Africa they are quite capable of performing such work, and at the same time of breeding regularly, but I consider that for heavy draft work such as ploughing, they are unsuitable in this climate I am not well acquainted with correspondent's district, but imagine that these horses would require to be stall-fed practically throughout the whole of the year. There is a growing demand for heavy draft horses ; and for Clydesdale stallions for crossing on the ordinary light mares of the country, there is also likely to be a good demand. Sound opinion is now taking the view that before using a thoroughbred sire, it is desirable to increase the bone and substance of the brood mares through a cross with one of the heavy draft breeds. One of these Clydesdale horses is capable of performing as much work as approximately three oxen. This Department has no Clydesdale mares for disposal at present. There are small studs of Clydesdales on this farm and at the Government Stud Farm at Standerton, but no females are likely to be sold for a number of years. We have, however, occasionally one or two young Clydesdale stallions to offer. At our next sale of stock which will probably take place on this farm in November next, it is expected that one young Clydesdale stallion will be sold. If correspondent intends to establish a stud of Clydesdale horses, I would advise him to import them from the south of Scotland. I may add that good young mares eligible for entry in the stud-book would probably cost about £100 per head landed at Colesberg, and a stallion would cost from £175 upwards, according to quality, breeding, and so forth.

FERTILIZERS FOR SANDY LOAMS.

V. E. D'Assorwille, Zandfontein, P.O. Heilbron, writes :—As I have lands that require fertilizing, and one is apt to make a serious mistake in applying the wrong kind of fertilizer, I would be glad to learn what is best to apply to a land of a red sandy loam and dark sandy loam. Also whether guano is a good fertilizer for mealies, and how to apply same, by sowing broadcast or by the planter method ?

Answer.—The Lecturer in Chemistry, School of Agriculture, Potchefstroom, replied :—It is impossible to advise you definitely, without a previous analysis of your soil, what artificial fertilizers to use. Should you have farmyard manure, you could not improve on a dressing every three years to your lands, supplemented the remaining two years by a small dressing—100 to 120 lb. per acre—of superphosphate, as much as the mealie planter distributes, or a mixture of two parts superphosphate and one part of bone meal if your land is very sandy. Farmyard manure supplies humus to the soil, in addition to its fertilizing ingredients, differing there essentially from artificial manures, and even guano,

Should you have no farmyard manure, a good system is to grow alternate crops, of leguminous plants (beans, etc.), and mealies or wheat, with the above phosphates at the rate of 200 lb. to the acre. For, in addition to your soil requiring, in all probability, phosphates, being sandy it will be the better for humus, which has valuable properties besides improving the soil in nitrogen. Guano is a manure well supplied with nitrogen and phosphates, and could be given to the soil should the two former systems be inconvenient. The first year or two, however, you could with profit use phosphates alone (as above), and ultimately displace these with applications of guano. A normal dressing of guano at the rate of 200 lb. per acre is best spread by hand, or with a broadcast spreader; smaller quantities, after sifting out the feathers, can be spread by means of fertilizing attachment on mealie planter at the rate of 100 to 120 lb. per acre.

PIG-WEED FOR WINTER FODDER.

F. Spencer, P.O. Springs, Transvaal, writes:—Would you kindly let me know if "pig-weed" can be stored, by cutting now, for dry winter feed? Also if ensilage can be made from it alone; and how, if possible, these things are to be made from it.

Answer.—The General Manager of the Experiment Farm, Potchefstroom, replied:—Cattle are fond of "pig-weed" when it is of young growth, and I am informed that silage has been successfully made of this plant and fed to stock, but I am doubtful whether stock would care for "pig-weed" dried and made into hay. In any case, if the growth is strong, the drying process, in order to make it fit for stacking, would take a considerable time, and consequently weather risks would be increased. Silage can be made from "pig-weed" alone, in the same way as it is made from other crops, but no evidence is available in regard to its feeding value.

SMOKY-FLAVOURED MILK.

H. Aenishaenslin, Grove Farm, P.O. Dynamite Factory, Modderfontein, writes:—Could you oblige me with any information *re* the following: I am dairy-farming near the Dynamite Factory, Modderfontein. On four different occasions during the last eight months, I have noticed a distinct smoky flavour in the milk, which is also noticeable in tea in which the milk is used. This only happens in the afternoon. I am inclined to think that it may be caused by some plant the cows eat on the veld when grazing. The cows are also being hand-fed with green lucerne, teff-hay, bran, and chaffed manna.

Answer.—The Superintendent of Dairying replied:—The smoky flavour perceptible in the milk at various times, and according to the statement of the correspondent only occurring in the afternoon, gives reason to suppose that this is really a "herbal taint" in the milk owing to the cows feeding on a certain plant while at pasture on the veld. This having happened on four occasions during the last eight months may be due to the fact that the plant was more abundant after a spell of wet or warm weather, as the case may be. Milk, of all things, taking up smells and taints very readily, may have taken on a smoky flavour at the time of milking, or while being strained or poured into bottles. Then some time may have elapsed before the milk was bottled in consequence of which the milk may have stood in open milk pails. If at this time smoky conditions prevailed in the yard, the milking room or the house, a smoky flavour could easily have been imparted to the milk. Every care should be taken to handle the milk as quickly and cleanly as possible from the time of drawing to bottling. Cooling the milk down quickly over a cooler is a great advantage as the milk is at the same time aerated, ridding it to a great extent of bad flavours.

PREPARATION OF COMMERCIAL ALOES.

S. Rabone, Graaff-Reinet, asks for advice as to the proper way in which the drug, aloes, is obtained from the aloe tree.

Answer.—The Acting Principal of the Grootfontein School of Agriculture, Middelburg (Cape), replied:—The leaves of the aloe are cut close to the plant in the heat of the day, and placed at once, cut downwards, in a V-shaped wooden vessel about 4 feet long and 18 inches deep. The vessel should be inclined sharply to allow the juice to run down quickly into a trough at the bottom. It usually takes one to four hours to fill a trough, and when full other troughs are used until five or six are full. The cutters then take the exhausted leaves and use them as manure. The juice is evaporated in a large copper vessel having a ladle at the bottom which catches the sediment, and can be emptied periodically. Vacuum

pans similar to those used for the concentration of sugar-cane juice can be used with advantage. As soon as the juice is thickened sufficiently it is poured into gourds or boxes and allowed to harden. The drug is then ready for the market.

ADVICE *RE* PUMPING PLANT.

J. Smithers, P.O. Box 52, Vereeniging, writes:—I have got 20 acres of greyish, sandy loam on the bank of the Vaal River, 11 miles west of Vereeniging, and I am anxious to irrigate this piece of ground. The bank is 33 feet high, and the water would run to any part of the 20 acres without difficulty from that point. What kind of pump would you advise me to get, and what would be the approximate cost of installation?

Answer.—The Acting Director of Irrigation replied:—Mr. Smithers has 20 acres of ground which he is anxious to irrigate; the ground is situated 33 feet higher than the water in the river. To irrigate this ground with a 3-inch watering, which is equivalent to a 3-inch rainfall, a pump capable of delivering 500 gallons per minute would be required. With a pump of this capacity 20 acres of ground could be irrigated in four days. For this purpose a suction gas engine, driving a centrifugal pump, is advised. The cost of such an installation would be approximately £390. The cost could be reduced by using a smaller pumping plant which will take, say, seven or eight days to do the same work. If correspondent wishes to go into this matter more thoroughly, he should apply for the services of an engineer of this Department.

OAKS FOR THE VAAL RIVER.

Mrs. E. T. Wooldridge, Johannesburg, writes:—I have a farm in the Orange Free State, on the banks of the Orange River, about 10 miles from Parys. I am desirous of planting a number of oak trees. Will you kindly inform me which kind of oak is the most suitable for such a locality. The frontage to the river is about 3½ miles, and the land rises back from the river to an elevation of about 200 feet in a mile and a half.

Answer.—The Conservator of Forests, Orange Free State Conservancy, replies that the most suitable variety of oak to grow in the conditions named is *Quercus pedunculata* (common oak).

NON-YIELDING HIVES.

A. F. Eriksen, "Portswood", Kuils River, C.P., writes:—Could any of your readers inform me how it is that I get no honey from two of my hives? I have six patent hives; from four of these I take out honey regularly every fourteen days, but from the other two I never get any honey at all—in fact, it seems to me as if the bees never visit the sections above at all.

Answer.—The above inquiry was referred to Mr. H. L. Attridge, who replies:—There are so many things that might account for the condition of matters mentioned by correspondent that it is somewhat difficult to diagnose the case without fuller information. It may be taken as a guiding principle, that for colonies to be remunerative they must be kept strong. Old or worn-out queens must be replaced by young and prolific ones. Weak colonies, say less than ten standard frames, are of very little use for honey gathering. The queens of such colonies may be able to produce a fair number of bees during the season, but such colonies will not be strong enough in numbers to take advantage of the crucial moment when the honey glut abounds. I would advise Mr. Erikson to re-queen the two faulty colonies, then probably—other conditions being equal—these hives will outstrip those which have been so productive this season.

Results of Egg-Laying Competitions.

WESTERN PROVINCE AGRICULTURAL SOCIETY.

Fourth Egg-Laying Competition.—16th May, 1911, to 15th May, 1912.

RECORD FOR FEBRUARY, 1912, AND TOTALS TO END OF FEBRUARY.

Pen Number.	Owner.	Breed. (Six Birds to a Pen.)	Record for Month. Eggs.	Weight. oz.	drms.	Total to Date. Eggs.	Weight. oz.	drms.	Position to Date.
1	F. W. Nicholson..	Buff Orpingtons..............	25	51	0	403	847	15	24th
2	F. T. Hobbs	Silver Wyandottes............	3	5	12	430	842	12	25th
3	A. Riley..........	Black Minorcas (R.C.)..........	3	6	4	313	619	9	26th
4	N. Cole	White Leghorns (Amer.) ...... (5 birds only; 1 died 14/2/12.)	39	80	9	574	1128	8	16th
5	S. T. Jones	White Leghorns (Amer.)	37	82	2	540	1168	8	12th
6	H. Curtis..	White Leghorns (Amer.)	28	58	11	582	1214	2	9th
7	S. C. Skaife......	White Wyandottes............ (5 birds only; 1 died 28/2/12.)	38	72	0	528	961	13	21st
8	A. Keppie.......	White Wyandottes............	19	34	7	497	919	12	23rd
9	S. A. West.......	White Leghorns (Amer.-Danish) (5 birds only; 1 died 5/11/11.)	27	58	3	512	1108	10	17th
10	H. H. Bright.....	Black Leghorns	19	39	8	690	1366	14	6th
11	B. Kauffmann ...	Brown Leghorns	40	78	7	573	1148	3	13th
12	B. Kauffmann ...	Black Leghorns	24	50	4	532	1139	14	14th
13	C. W. Pilkington .	Rhode Island Reds .... (5 birds only; 1 died 29/1/12).	32	70	0	450	981	10	20th
14	W. P. Cowan	White Leghorns (Eng.)........	42	85	14	738	1442	11	3rd
15	A. J. Stacy......	White Leghorns (Aust.-Amer.) (Re-entered from pens Nos. 5 and 51 last competition for second year test)	49	109	2	742	1570	9	1st
16	B. Kauffmann ...	White Leghorns (Eng.-Amer.).. (5 birds only; 1 died 18/11/11.)	44	100	13	672	1411	2	4th
17	S. Smith	Brown Leghorns	34	72	0	493	1013	12	19th
18	Mrs. H. H. Bright	White Leghorns (Aust.)....... (4 birds only; 2 died 2/11/11.)	39	76	11	629	1199	13	10th
19	N. Cole	Brown Leghorns..............	44	93	3	607	1274	13	8th
20	F. Molteno	White Leghorns (Amer.)	47	91	12	613	1138	2	15th
21	C. H. van Breda..	White Leghorns (Aust.)	46	90	15	769	1493	8	2nd
22	Mrs. C. H. van Breda	White Leghorns (Amer.).......	32	67	10	598	1169	7	11th
23	S. A. West.......	Brown Leghorns	25	48	6	582	1102	11	18th
24	Graham, Hope & Co.	White Wyandottes	37	75	1	645	1286	12	7th
25	R. V. R. Jones...	White Leghorns (Amer.-Aust.) .	15	34	4	482	947	13	22nd
26	S. Smith	White Leghorns (Dan. & Amer.)	39	78	10	734	1409	6	5th

REPLACEMENTS (SCORES DEDUCTED FROM PEN TOTALS).

Pen No. 3.—No. 17 died. Replaced 23rd October. Score, 68 eggs; weight, 123 oz. 5 drms.

Pen No. 4.—No. 22 died. Replaced 4th November. Score, 62 eggs; weight, 110 oz. 14 drms.

Pen No. 5.—No. 28 died. Replaced 26th October. Score, 39 eggs; weight, 80 oz. 14 drms.

Pen No. 6.—No. 31. Replaced 22nd November. Score, 58 eggs; weight, 124 oz. 11 drms.

Pen No. 11.—No. 65 died. Replaced 3rd November. Score, 63 eggs; weight, 140 oz. 10 drms.

Pen No. 12.—No. 67 died. Replaced 28th September. Score, 38 eggs; weight, 78 oz. 4 drms.

Pen No. 19.—No. 112 died. Replaced 27 August. Score, 35 eggs; weight, 74 oz. 10 drms.

MANAGER'S REPORT FOR FEBRUARY, 1912.

The drop in the number of eggs this month is, I regret to say, very considerable; this is owing chiefly to the great majority of the birds being in moult. The total is only 823.

Thirty-seven eggs in one day was the highest total reached and 16 the lowest.

The pens with the highest totals of eggs are No. 15, 49; No. 20, 47; No. 21, 46; Nos. 16 and 19, 44 each; and No. 14, 42. Those with the highest total weights are: Pen No. 15, 109 oz. 2 drms; No. 16, 100 oz. 13 drms.; No. 19, 93 oz. 3 drms.; No. 20, 91 oz. 12 drms.; No. 21, 90 oz. 15 drms.; and No. 14, 85 oz. 14 drms.

The highest individual scores in eggs are No. 89, 25 (this bird laid 26 eggs, but broke 1 in the nest, although it counts in her record, it cannot be added to her competition score); No. 94, 21; No. 105, 20; and Nos. 62, 104, 118, and 121, 19 each.

The highest individual weights in eggs are: No 89, 58 oz.; No. 94, 46 oz. 12 drms.; No. 104, 38 oz. 11 drms.; No. 110, 38 oz. 10 drms.; No. 105, 38 oz.; and No. 91, 37 oz. 14 drms.

The health of the birds, with two exceptions, has been good—apart from these there has been no case of illness. Unfortunately, the two alluded to ended fatally; a foregone conclusion in view of the fact that they were both cases of tuberculosis of the liver (going light), which is incurable, or at any rate no cure has as yet been discovered. One case was that of the bird mentioned in my last report as having had an attack of cerebral hæmorrhage and subsequent paralysis of one leg; this naturally lowered her vitality, with the result that the tubercle bacilli latent in her system immediately seized the opportunity for attack, and at the commencement of this month the bird began to show internal symptoms of the disease, which ran its normal course. She lost weight rapidly, and on 14th February died, her weight at death being 1 lb. 14 oz.; her paralyzed leg was naturally very shrunken, weighing 2 oz. 1 drm.. as against 3 oz. 5 drms., the weight of the normal one. On making a post-mortem examination, I found the liver, which weighed 2 oz. 4 drms., a mass of tubercular abscesses and cysts; the kidneys were in the same condition, as were also the left lung, and the peritoneum was thickened and adherent to all the abdominal organs.

The other case was that of a bird in which the external symptoms of the disease became apparent shortly after she started her moult. Here again we have a lowered vitality, which is always more or less apparent during the moult, giving the tubercle bacilli the chance for which they are continually on the watch, for every case of tuberculosis of the liver can be traced to this cause, viz., a lowered vitality. This bird was by the way the lightest in her pen, weighing on her arrival here 3 lb. 7 oz., while the average of her five companions was 4 lb. 15 oz. She had a crooked breast-bone which, in my opinion, decidedly shows a weak constitution; this and a notched breast-bone, I may mention, are two very different things, the former as I say is the result of a weak constitution. the latter is due to too early perching. This bird weighed at death 1 lb. 14½ oz., the liver, which scaled 5 oz. 2 drms., contained tubercular nodules scattered about throughout the whole of its substance, there were also a few in the walls of the intestines; the other organs were normal, judging from naked eye examination. There is no doubt that tuberculosis among fowls is very prevalent, and in my opinion this and enteritis are the two commonest and worst diseases fowls in this country are heir to, and of the two I consider tuberculosis the worse, for it is bhot hereditary and can be acquired, whereas the latter (enteritis) can only be acquired, and can, except in virulent cases be cured, the former cannot. Eighty-one birds have been in moult during the month, the majority of these are now through it. Fourteen birds have been broody, one of these only is now affected, and I think she will be the last to become so this season.

The weather has been generally favourable for the birds, especially for those going through the moult; there has been rain on only four occasions, the days have been usually warm and bright, but never too hot, certainly not sufficiently so to cause the birds any discomfort, but as I said in one of my former reports, a blazingly hot sun, provided the birds are not over-fat, affects them less than does a close sultry atmosphere.

In conclusion, I should like to mention for the benefit of those breeders who are respectively interested in English Exhibition White Leghorns and English Utility ones, I have several times been asked which of the two varieties Pen No. 14 consists. They are English Utility White Leghorns, all of a good laying type. There are no English Exhibition ones on the competition: the difference, as we know, between these two varieties is very marked.

ARTHUR LITTLE.

Importation of Live Stock.

RETURN showing particulars of certain Pure-Bred Live Stock imported into the Union of South Africa.

Stud-Book No. or Name.	Breed and Stud-Book in which Registered.	Sex.	Country of Origin.	Importer's Name and Address.
Unknown.......	36 Lincoln Sheep - Unknown	Ewes	Australia..	Cold Storage Co., East London (1/3/12).
Unknown.......	1 Lincoln Sheep—Unknown	Ram	Australia..	Cold Storage Co., East London (1/3/12).
"Glouxas" No. 11	Ass Catalan (Spain)...	Jack	Spain.....	Geo. Colling, Hankey, C P. (8/3/12).

Notes on the Weather.

NATAL PROVINCE.—FEBRUARY.

In continuation of the weather notes for the year 1911 given last month, a short table has been drawn up which it is thought may be of interest to readers. Several stations have been selected for purposes of comparison, and the table shows for each of these stations the average maximum and minimum temperature throughout the year, the extremes of heat and cold with the dates on which they were recorded, and the total rainfall for the year, together with the number of days on which rain was collected.

Abstract of Meteorological Results (Natal) for the Year 1911.

Station.	Temperature in Shade (Fahr.).						Rainfall.	
	Means.		Extremes.					
	Max.	Min.	Max.	Day.	Min.	Day.	Total inches.	No. of days.
	°	°	°		°			
Empangeni	81 ·9	58 ·9	108	Oct. 18	36	June 29	50 ·58	83
Stanger	80 ·4	58 ·5	112	Oct. 18	42	July 17	64 ·07	80
Durban Observatory	78 ·1	61 ·9	99	Oct. 18 Oct. 19	45	July 17	42 ·32	121
Imbizana	78 ·8	58 ·0	98	Oct. 20	42	June 29	46 ·60	104
Pietermaritzburg	77 ·2	51 ·7	105	Dec. 21	28	June 29 July 16 July 17 July 18	38 ·71	126
Weenen	85 ·6	48 ·2	109	Dec. 20	19	June 29	29 ·63	106
Greytown	76 ·3	49 ·4	104	Dec. 21	25	June 28 July 16	41 ·58	100
Bulwer	67 ·3	44 ·5	89	Oct. 18 Dec. 20	18	June 29	45 ·02	158
Ladysmith	81 ·6	50 ·8	108	Dec. 20 Dec. 31	23	June 28 June 29 June 30	29 ·56	112
Newcastle	79 ·1	40 ·7	103	Dec. 31	16	June 28 June 29	44 ·17	88
Vryheid	83 ·4	50 ·9	100	Dec. 22	28	June 28	40 ·91	105
Melmoth	78 ·7	55 ·2	105	Dec. 22	38	June 27	30 ·17	119
Mahlabatini	80 ·5	48 ·5	101	Dec. 21	34	June 28	38 ·96	62
Ubombo	76 ·9	62 ·0	99	Dec. 22	44	June 28 June 30	32 ·51	67

February may be said to have on the whole well maintained its position as the hottest month of the year. All along the coast and as far north as Nottingham Road the mean temperature was from 1° to 3° higher than during January, and the general average throughout the Province gives a mean temperature just 1° higher, though the mean daily range of temperature was slightly lower, pointing to the prevalence of warmer nights. In Zululand, with the exception of Hlabisa, the returns show February to have been rather warmer than the previous month, but in the Umvoti, Weenen, Klip River, Newcastle, Dundee, and Vryheid Districts it was appreciably cooler. At Paulpietersburg there was practically no variation from January conditions. In Durban February was an exceedingly trying month, the mean temperature—77 ·15°—being the highest recorded at the Observatory since 1902, and ·76° above the average for twenty years. The lowest point touched by

the Observatory thermometers was 63·7°, and the average maximum in the sun was 133·5° (all F.). The mean barometric pressure for the month was 30·012 inches, or ·013 inch below the average for twenty years.

Precipitation was not very much heavier in February than during the preceding month, and there is a considerable shortage of rain along the coast. Only two stations reported a total fall of over 10 inches, viz. Ngomi Forest, 13·28 inches; and Bulwer, 12·21 inches. At the latter place there were only three days on which rain was not collected, and 4·40 inches were taken on the 11th. Other considerable falls occurred at Newcastle on the 2nd, 3·30 inches; and at Ngomi Forest on the 18th, 3·09 inches. The general average of 44 recording stations shows that 5·05 inches of rain fell on 14 days during the month, compared with 4·78 inches on 12 days during the first month of the year. The average fall on the coast was 2·92 inches on 12 days, in the Midlands 5·31 inches on 16 days, on the Highlands 6·83 inches also on 16 days, and in the interior of Zululand 4·42 inches on 9 days.

TEMPERATURE (NATAL), FEBRUARY.

Station.	Mean Maximum.	Mean Minimum.	Monthly Mean.	Abs. Maximum.	Abs. Minimum.	Mean Daily Range.
	°	°	°	°	°	°
Observatory, Durban	84·1	70·2	77·2	90	64	13·9
Stanger	85·8	67·6	76·7	107	60	18·2
Verulam	89·7	68·6	79·1	108	60	21·1
Hillary	81·5	68·8	75·2	92	61	12·7
Umbogintwini	87·8	69·6	78·7	97	59	18·2
Winkle Spruit	83·3	68·1	75·7	93	62	15·2
Umzinto	94·4	60·1	77·2	103	58	34·3
Port Shepstone	84·2	68·9	76·5	94	63	15·3
Imbizana	84·7	67·9	76·3	95	62	16·8
Harding	87·3	57·5	72·4	94	51	29·8
Mid-Illovo	76·7	62·7	69·7	90	57	14·0
Bulwer	73·7	56·4	65·0	83	50	17·3
Himeville	81·9	56·3	69·1	92	45	25·6
Richmond	80·6	60·3	70·4	94	55	20·3
Pietermaritzburg	84·5	62·4	73·5	98	57	22·1
Howick	82·9	60·3	71·6	94	55	22·6
Cedara Vlei	80·0	58·1	69·1	92	51	21·9
Albert Falls	87·9	62·3	75·1	100	57	25·6
New Hanover	87·2	59·6	73·4	98	57	27·6
Greytown	82·5	56·1	69·3	93	47	26·4
Krantzkop	89·2	58·8	74·0	96	50	30·4
Lidgetton	86·2	48·4	67·3	95	41	37·8
Nottingham Road	81·7	54·4	68·1	91	49	27·3
Estcourt	96·4	60·1	78·2	103	54	36·3
Weenen	89·8	62·0	75·9	104	58	27·8
Mpofana	89·0	61·0	75·0	98	54	28·0
Ladysmith	88·5	62·9	75·7	101	54	25·6
Dundee	84·8	63·5	74·2	99	59	21·3
Newcastle	87·7	58·0	72·8	96	49	29·7
Vryheid	82·3	60·7	71·5	93	52	21·6
Paulpietersburg	89·0	59·3	74·2	95	50	29·7
Ngomi Forest	78·9	59·9	69·4	87	49	19·0
Ingwavuma	86·8	64·1	75·4	100	57	22·7
Ubombo	85·6	68·4	77·0	99	63	17·2
Nongoma	86·4	62·0	74·2	97	57	24·4
Hlabisa	82·6	65·8	74·2	95	60	16·8
Mahlabatini	86·4	57·4	71·9	97	50	29·0
Melmoth	85·6	63·0	74·3	98	54	22·6
Empangeni	91·0	69·0	80·0	105	61	22·0
Mtumzini	88·1	53·3	70·7	98	40	34·8
Amatikulu	89·6	68·8	79·2	103	60	20·8
MEANS	85·5	62·0	73·8	—	—	23·5
EXTREMES	—	—	—	108	40	—

Thunderstorms were frequent at Bulwer, Bushman's Nek, Mid-Illovo, New Hanover, and Paulpietersburg, and fairly frequent at Richmond and Ngomi Forest, and practically all the stations were visited by storms once or twice during the month. It only remains to be mentioned that earth tremors were felt at several places about 3.5 p.m. on the 20th February, but no definite details regarding the shock can be given, as the Observatory is not furnished with a seismograph.

OBSERVERS' NOTES.

Imbizana.—The features of the month in this district have been the great heat and small rainfall; a rainfall of only 1·68 inches for February has hardly been known before, while the heat too has been exceptional. Where the land has been well cultivated, the small showers have been sufficient to keep most of the crops growing, in other places the crops will be very poor. East Coast fever is still spreading through the division, slower now than at first, as the movement of stock has been greatly restricted, but at the same time at every place where there is no proper dipping going on, the cattle are doomed. (C. H. Mitchell.)

Mid-Illovo.—Rain during February was registered on 20 days, totalling 2·63 inches; 0·71 inch having been registered on Sunday, 25th, and 0·31 inch on Thursday, 22nd, caused by a sharp thunderstorm. On the latter date the maximum heat was registered, 90° in the shade, the minimum being 57° on the 6th. On Tuesday, 20th, an earth tremor was felt about 3.6 p.m. Crops on the whole may be considered very fair, though top grub is giving trouble in the maize crop. Several cases of horse-sickness have been reported during the month, otherwise stock is looking well. (J. W. V. Montgomery.)

Nottingham Road.—Drought has broken up, and there has been a very heavy rainfall, 9·63 inches against 3·20 inches during February, 1911. The earthquake of the 20th was felt in many parts of the district. Bar horse-sickness, which is worse than usual, stock is healthy.

Ladysmith.—The total rainfall for the month was 5·61 inches, that for February, 1911, having been 3·35 inches. The mean maximum temperature (88·5°) was 2·5° less than that for the corresponding month of last year, and the mean minimum temperature (63°) was 3° higher than last February. Heavy thunderstorms have been experienced in various parts of the district, and several drowning fatalities have resulted from the flooding of rivers in the vicinity of the Drakensberg. (J. C. Haycroft.)

Ngomi Forest.—Rain was registered at this station on 20 days. During the first half of the month we had fairly steady rains, but from the 18th to the 26th we had some very heavy rains, and during this period of nine days 10·90 inches fell. The total fall for the month was 13·28 inches; in February, 1910, 12·98 inches were registered here, and in February, 1911, 4·39 inches. During the month we had several severe thunderstorms, on the 18th, 20th, and 24th the storms were heaviest, and rain fell as follows: 3·09 inches, 2·40 inches, and 1·93 inches respectively, while on the 25th a very heavy rain (2·06 inches) fell all day. Crops, taking them all round, are not looking badly—even the natives' crops that have been attended to are looking well; cattle, etc., appear in good condition. (W. H. Foster.)

Mpofana.—Nothing unusual, fair rains for thorns, although not up to last year's fall, and mealie crop in thorns a total failure. Mabele crop promised a fair return, but aphis has appeared, and many fields are badly affected. (R. D. Talbot.)

Nongoma.—Some very hot weather has been experienced during the month, the 19th being the hottest day, when the thermometer reached 97°. The minimum for the month was on the 27th, when the temperature went as low as 57°. There has been a good rainfall, mostly soaking rains. There were also one or two storms, but very little rain fell on these occasions. The earthquake shock was not felt here. (T. R. Bennett, jun.)

Empangeni.—The weather was very dry and hot, as from the 3rd to the 20th. On the latter date the thermometer rose to 105°, and what promised to be a heavy storm came up and thunder and lightning commenced, but it all blew off in the afternoon, though it came on again in the evening, with the result that 0·25 inch of rain fell, freshening things up a little. Crops and stock continue to look well; of course, the main crop here is sugar-cane, which is looking remarkably well. Mealies are looking fairly well, but the drought has had a bad effect on them, and the natives will have a very poor crop. (H. Tarboton.)

TRANSVAAL PROVINCE.—FEBRUARY.

SUMMARY.—The rainfall for the month was near the average, although its distribution was somewhat irregular; thus along the eastern border the rainfall was much below the average, whilst over the south-west and centre of the Province the rainfall was above the average, the excess being most marked in the extreme south-west. The rainfall occurred

chiefly at the beginning and end of the month, the middle of the month being dry. The season's rainfall (eight months) still shows a deficit in all but the south-western and extreme south-western districts. In Waterberg, Zoutpansberg, and Barberton Districts the shortage is very considerable; at Potgietersrust, for instance, it is over 10 inches.

OBSERVERS' WEATHER REPORTS.

BARBERTON DISTRICT—

Macsvale.—We have been having a very dry, unsatisfactory season, and most crops have suffered severely. During my residence of about twenty-five years in this district I have not known such a dry, hot season. On the 20th and 21st 1·23 inches of rain were registered at my house, but on my farm—half a mile away—no rain fell. The citrus trees are looking very bad. The fountains are so low that there is not sufficient water to irrigate. The outlook for the winter is serious.

The rains this season have been extremely local. A few farmers in the Kaap Valley have had sufficient for their crops; others have had even less rain than I have had. (W. P. Macpherson.)

BETHAL DISTRICT—

Leeuwkuilen.—February has been a very disappointing month, the rainfall being very unevenly distributed. Nice rains fell from the beginning of the month up to the 11th, but with the exception of one shower on the 18th, practically no rain fell up to the end of the month. My neighbours to the south of the railway line had heavy showers; one farmer told me he had quite enough rain for the month. (W. J. Wayland.)

CAROLINA DISTRICT—

Waterval Boven.—Very little rain fell. The month was particularly warm. It was a little cooler after the 26th. (H. C. Borcherds.)

LYDENBURG DISTRICT—

Belfast.—The month has been warm and exceptionally dry. Strong winds prevailed on the 25th and 26th. The grass minimum thermometer recorded 35·1 and 36·2 on the mornings of the 28th and 29th respectively. (G. J. Imrie.)

Castcel.—The country is very dry; mealie crops dying for want of rain. (R. T. Hall.)

Lydenburg.—Rain wanted badly for crops and grazing. (Sergeant H. G. Caldwell, Transvaal Police.)

Maboki.—This past month has been the driest February known for many years. What rains have fallen have been slight and have soon evaporated. The middle of the month was oppressively hot, even at night. The crops naturally have suffered, especially those of the natives, whose system of cultivation depends on copious rains for any chance of success. The rainfall for the whole season since 1st July has been considerably below the mark, 22·12 inches only having been registered, of which 10·61 inches fell on three occasions—6·09, 2·51 (in forty minutes), and 2·01 inches. Of these, the first and second did more harm than good. (S. H. Boyle.)

MIDDELBURG DISTRICT—

Middelburg.—The rainfall for the month has been in this town slightly above the average for the past nine years. It has been in the nature of localized thunderstorms and extraordinarily patchy; thus certain farms in this district have been persistently passed over this year by storms which have visited every farm around them.

Speaking generally, the crops on the high veld are well up to the average, and on farms here and there even unusually good; but on the low veld to the north of this district, where the summer rains have almost entirely failed, the crops have generally withered before maturing. What has been much missed this year is the steady, soaking, and general rainfall which comes up sometimes with a south-easterly wind, and continues for three or four days. It is such rains that replenish the springs and keep them going the winter through. The rain this year has been generally sufficient for the crops, but not for the springs, which may be expected in this district to give out early during the coming winter. (Dr. H. A. Spencer.)

POTCHEFSTROOM DISTRICT—

Klerksdorp.—On the afternoon of the 4th very heavy thunder was experienced, accompanied by a fine shower of rain. On the 20th very heavy and loud thunder was experienced at about 1 p.m., with heavy rain and a shock of earthquake at 3·5 p.m., which shook buildings slightly, but did no damage; a slight rumbling noise was also heard. At 1.30 p.m. on the 22nd a violent gust of wind struck the railway goods shed during a heavy rain and unroofed it. The wind was blowing from the north-west, but not strong, and if the gust or cyclone travelled with the wind it must have passed over a corner of the town, but the only damage in the line was a gate blown down and an outbuilding blown over. (H. M. Guest.

STANDERTON DISTRICT—

Weltevreden.—The past month has been a very wet one. Rain fell on almost every day, the total for the month reaching 9·48 inches. A few severe thunderstorms have been

experienced; some oxen and horses being killed. The general conditions as regards the mealie crops have improved, but the outlook for grain crops is poor. (D. Rane.)

RUSTENBURG DISTRICT—

Wolhuterskop.—An exceptionally hot and dry month. (J. C. P. Maynard).

WAKKERSTROOM DISTRICT—

Wakkerstroom.—Splendid rains have fallen this month, which were just in time to save the crops. (W. Pritchard.)

WATERBERG DISTRICT—

[illegible]room.—Country suffering from drought; rainfall unusually small; local water diminishing. (Constable E. B. Gibson.)

ZOUTPANSBERG DISTRICT—

Louis Trichardt.—Total rainfall for the month was 6·86 inches on 8 days, of which, however, only 1·25 inches on 2 days were registered prior to the 22nd, since when the oppressive heat of the earlier part of the month has moderated and given place to much cooler weather. Many local thunderstorms have occurred. Speaking generally, the arrival of the general rains has been too late to save crops affected by the earlier drought. (Sergeant J. C. N. Clark, Transvaal Police.)

Mashutiesberg.—No thunder or thunder showers have been experienced here during this month. (J. S. Stewart.)

Pietersburg.—The drought still continues. From the 9th of the month no rain has fallen. Heat still considerable day and night; veld quite bare; many wells dry, others nearly so. (C. C. Hicks.)

Tzaneen.—An exceptionally dry month. Only 2·90 inches fell as compared with 7·75 in corresponding month of previous year. (G. F. Savage.)

BECHUANALAND PROTECTORATE—

Mochudi.—Heavy shortage of rain this month. No crops. Heat excessive. (W. A. H. Harbor.)

TEMPERATURE.

Place.	Observer.	For the Month.			Average Mean during past nine years.	Difference from average mean.
		Mean Max.	Mean Min.	Mean.		
		°	°	°	°	°
Barberton.........	Acting Town Clerk..	85·6	66·6	76·1	72·8	+ 3·3
Bloemhof.........	C. C. Campbell......	85·5	64·9	75·2	72·5	+ 2·7
Johannesburg—						
Joubert Park....	Geo. Weeks.........	79·8	58·3	69·0	66·6	+ 2·4
Observatory.....	Staff...............	76·4	58·5	67·4	64·5	+ 2·9
Komatipoort......	—	95·1	71·5	83·3	78·8	+ 4·5
Pietersburg........	W. Frankleyne......	87·4	62·3	74·8	70·2	+ 4·6
Pretoria, Arcadia..	J. Lyall Soutter......	85·5	62·3	73·9	71·2	+ 2·7
Volksrust.........	Station Master, S.A.R.	77·8	57·2	67·5	64·2	+ 3·3
Zeerust...........	H. Dietrich, J.P......	87·6	64·0	75·8	72·3	+ 3·5

The month throughout has been unusually warm over the whole Province. Both day and night temperatures have been about 3° above the average.

ORANGE FREE STATE.—FEBRUARY.

SUMMARY OF METEOROLOGICAL OBSERVATIONS.

(a) MEANS.

Station.	Barometer.	Dry.	Wet.	Dew Point.	Rel. Hum.	Max.	Min.	Mean.	Range
	Inches.	°	°	°	%	°	°	°	°
Ben Avis	—	68·2	61·8	57·1	67	82·6	58·2	70·4	24·4
Bethulie...........	25·858	72·2	64·7	59·4	63	88·0	63·1	75·5	24·9
Bloemfontein	25·518	69·0	62·8	58·1	68	82·2	61·8	72·0	20·4
Grootkuil..........	25·784	69·0	63·0	58·3	69	82·1	67·1	74·6	15·0
Harrismith	- -	62·3	59·6	57·0	84	73·4	54·4	63·9	19·0
Holfontein.........	—	69·6	64·5	60·6	74	82·5	59·1	70·8	24·4
Imperani	—	67·1	59·1	54·2	63	78·2	58·0	68·1	20·2
Ladybrand	—	66·8	63·2	60·0	80	72·6	56·3	64·5	16·3
Lindley	25·218	67·9	62·3	57·6	70	79·2	59·2	69·2	20·0
Modderpoort	24·868	67·3	62·4	58·4	74	82·7	56·6	69·7	26·2
Tweespruit	25·003	67·1	60·9	56·1	68	82·6	—		
Vierfontein	—	70·0	64·8	60·9	73	82·0	61·2	71·6	20·8

(b)– EXTREMES.

Station.	Barometer.		Temperature.	
	Maximum.	Minimum.	Maximum.	Minimum.
	Inches.	Inches.	°	°
Ben Avis...............	- -	—	90·9 on 1st	50·8 on 7th
Bethulie	26·083 on 26th	25·692 on 6th	95·7 on 1st	59·0 on 9th and 26th
Bloemfontein	25·736 on 26th	25·389 on 6th	94·1 on 1st	51·9 on 7th
Grootkuil	25·987 on 26th	25·666 on 6th	96·7 on 1st	60·0 on 7th
Harrismith	—	-	86·1 on 1st	48·0 on 27th
Holfontein	—		93·2 on 1st	45·0 on 17th
Imperani................		–	91·0 on 1st	17·9 on 7th
Ladybrand	—	—	88·0 on 1st	50·0 on 6th
Lindley	25·407 on 26th	25·099 on 6th	91·9 on 1st	52·5 on 7th
Modderpoort	25·049 on 26th	24·755 on 1st	92·1 on 1st	44·3 on 7th
Tweespruit	25·123 on 17th	24·914 on 5th	93·8 on 1st	---
Vierfontein.............	—	- -	91·1 on 1st	55·0 on 27th

Rainfall Returns.

NATAL—FEBRUARY.

	Inches.		Inches.
Durban (Observatory)	2·58	Krantzkop	3·65
Do. (Point)	2·83	Lidgetton	6·08
Stanger	2·99	Nottingham Road	9·63
Verulam	2·12	Estcourt	4·96
Hillary	2·65	Weenen	4·56
Umbogintwini	2·58	Mpofana	3·11
Winkle Spruit	1·70	Ladysmith	5·61
Umzinto	2·96	Dundee	3·67
Port Shepstone	1·28	Newcastle	6·60
Imbizana	1·68	Utrecht	3·30
Harding	3·82	Vryheid	3·20
Mid-Illovo	2·63	Paulpietersburg	7·15
Bulwer	12·21	Ngomi Forest	13·28
Himeville	9·19	Ingwavuma	2·62
Bushman's Nek	9·66	Ubombo	2·73
Richmond	7·06	Nongoma	4·13
Pietermaritzburg	6·23	Hlabisa	6·44
Howick	7·27	Mahlabatini	4·40
Cedara (Vlei)	7·96	Melmoth	6·19
Albert Falls	4·57	Empangeni	2·48
New Hanover	5·84	Mtunzini	5·59
Greytown	6·24	Amatikulu	6·57

TRANSVAAL—FEBRUARY.

	Inches.		Inches.
Barberton	2·47	Potchefstroom	5·80
Komatipoort	1·09	Klerksdorp	6·34
Bethal	2·70	Pretoria (Arcadia)	7·09
Christiana	9·81	Modderfontein	4·42
Carolina	1·82	Rustenburg	4·98
Ermelo	2·84	Standerton	6·34
De Hoop	5·85	Wakkerstroom	6·08
Heidelberg	10·08	Volksrust	7·17
Vereeniging	6·94	Potgietersrust	1·48
Lichtenburg	6·31	Krugersdorp	4·95
Pilgrims Rest	2·78	Joubert Park (Witwatersrand)	6·55
Belfast	2·44	Observatory	5·28
Zeerust	3·13	Pietersburg	1·26
Middelburg	4·41	Louis Trichardt	6·86
Piet Retief	3·01		

ORANGE FREE STATE—FEBRUARY.

Bethlehem District:	Inches.	Bethulie District:	Inches.
Abersethin	7·92	Town	2·66
Bellevue	9·33	Abercairn	3·30
Kaal Laagte	8·25	Niet-te-Weet	5·12
Middelpunt	7·47	Normandale	3·97
Novo	8·69	Priors	3·37
Reitz	8·78	Springfontein	
Rondehoek	8·34		
Whinburn	7·98		

BLOEMFONTEIN DISTRICT:	Inches.
The City—	
Arboretum	4·08
Government Laboratories ...	3·18
Grey College School ...	3·60
Hamilton Park	3·71
Bainsvlei	5·39
Brandfort	7·47
Devon Farm	3·67
Donkerhoek	5·69
Doornplaat	3·15
Dunmanway	5·06
Ellerslie North	3·94
Glen Lyon	5·78
Kelvedon	1·82
Kuilput	2·67
Mazels Poort	4·45
Nieuwjaarsfontein	4·75
Pakpoort	3·00
Platkop	3·51
Reddersburg	3·92
Roodepoort	4·54
Sannah's Post	4·08
The Willows	3·39

BOSHOF DISTRICT:	
Beginseldam	11·46
Brakfontein	5·52
Dealesville	4·79
Eagles Nest	2·71
Kanonfontein	3·49
Knapdaar	10·60
Mahemsvley	7·04
Smithskraal	7·43

EDENBURG DISTRICT:	
Boomplaats	1·90
Excelsior	3·38

FICKSBURG DISTRICT:	
Town	10·01
Bosrand	10·77
Caledon Draai	5·25
Dekselfontein	10·38
Dunblane	9·86
Fouriesburg	9·16
Gunton	5·82
Hammonia	9·02
Imperani	9·10
Kalkoenkrantz	10·62
Kirklington	10·30
Kranskloof	9·95
Lusthof	9·43
Platkop	6·08
Prynnsberg	8·03
Sandford	5·31
Zuikerkop	5·74

FAURESMITH DISTRICT:	
Brakdam	2·62
Klipnek	4·09
Koffyfontein	1·28
Lokshoek	3·65

FAURESMITH DISTRICT (contd.):	Inches.
Middelfontein	1·60
Mimosa	7·11
Newlands	4·72
Rust-en-Vrede	1·47
Sleutelspoort	1·74
Tevredenheid	3·15
The Poplars	2·80

FRANKFORT DISTRICT:	
Town	6·01
Muirton	8·00
Vryheid	5·19
Zandoog	7·38
Belladale	11·54

HARRISMITH DISTRICT:	
Afrika's Kop	8·50
Arbeid Adelt	8·07
Buckland Downs	11·18
Forest Station	9·68
Hartbeestfontein	6·46
Mill Barton	8·86
Tandjesberg	8·56

HEILBRON DISTRICT:	
Brereton	6·39
Honing Kloof	6·17
Kroonbank	7·95
Maccauvlei	5·73
Viljoen's Drift	1·76

HOOPSTAD DISTRICT:	
Town	6·46
Bultfontein	8·05
Commando Drift	10·71
Fairfield	5·87
Grenadendal	6·53
Rietkuil	6·69
Roodepoort	9·72
Vergezicht	7·66
Vooruitzicht	6·42

JACOBSDAL DISTRICT:	
Town	1·70
Aschboschdam	1·93
Aurora	2·60
Zoutpan	5·08

KROONSTAD DISTRICT:	
Town	7·31
Cransbrooke	5·84
Congleton	5·46
Geduldfontein	6·84
Gelukfontein	6·48
Hebron	5·80
Holfontein	8·08
Vierfontein Mine	7·23
Voorspoed Mine	7·71
Waterford	6·53

LADYBRAND DISTRICT:	Inches.
Town	6·60
Alma	7·55
Barletta	5·91
Braemar	6·29
Clocolan	8·10
Government Nursery	5·95
Lambertina	7·67
Modderpoort	6·12
Moria	4·70
New Vale	6·11
Paardeberg	7·03
Rangershoek	6·24
Westminster	4·68
Zorgvliet	6·83
LINDLEY DISTRICT:	
Town	8·34
Kerry	7·71
Lindley Road	8·41
Waterford	8·12
PHILIPPOLIS DISTRICT:	
Donkerpoort	1·90
Highbury	5·33
Karreefontein	3·13
Krielsfontein	2·74
Tuinplaats	2·42
ROUXVILLE DISTRICT	
Town	7·88
Ben Avis	3·83
Clearwater	5·71
La Mortola	5·95
Middelplaats	7·46
Oudefontein	5·37
Ramelies	4·40
Riversdale	4·98
Sterkfontein	7·93
SENEKAL DISTRICT:	
Vischgat	5·19
SMITHFIELD DISTRICT.	
Town	2·90
Helvetia	3·88
Holstein	3·24
Settlement	4·24

THABA 'NCHU DISTRICT:	Inches.
Town	4·86
Burgundy	5·47
Carrigholt	4·35
Fort Bassett	4·03
Groot Hoek	3·10
Likatlong	4·10
Moroka Industrial School	2·18
Mount Stephen	4·82
Ramalitsi	4·70
Strathearn	4·28
Thorley	3·18
Tweespruit	4·22
Wilgeboom Nek	3·51
York	4·02
VREDE DISTRICT:	
Town	6·34
Woudzicht	8·31
VREDEFORT DISTRICT:	
Town	7·40
Bodeskraal	5·28
Springbokvlaakte	4·99
WEPENER DISTRICT:	
Alkmaar	2·31
Kalkfontein	3·97
Lucerne Valley	2·72
Meander	3·33
Mon Repos	3·95
Wonderboom	2·55
Zamenloop	2·89
WINBURG DISTRICT:	
Town	11·84
Beddington	16·28
Burnet Holm	5·85
Foxhill	10·60
Grootkuil	6·83
Hayfield	8·31
Paardekraal	8·95
Roodekop	8·18
Smaldeel	9·56
Vaalbankskuil	8·79

Outbreaks of Animal Diseases.

THE following outbreaks of scheduled infectious and contagious animal diseases have occurred in the areas specified during the month ended 31st March, 1912:—

CAPE PROVINCE PROPER.

(EXCLUDING TRANSKEIAN TERRITORIES.)

Anthrax.

District.	Area.	Number of Deaths.	Number of In-contacts.
Alexandria	Farm "The Post"	1	Unknown
,,	Niekerk's Hope	1	,,
,,	Village	1	,,
,,	Ouplaats	1	50
Barkly West	Klipdam	1	Unknown
Cape	Groot Schuur, Rondebosch	1 Eland	,,
Hay	Cone	1	,,
Komgha	Section 18, xiii/39, Kei Kop	1	80
,,	Section 17, xiii/39, Kei Kop	1	42
,,	Farm No. 279	1	Unknown
,,	Farm No. 16, xiii/37	1	36
,,	Lot No. 3, xiii/39	1	12
,,	Lot No. 13, xiii/35	1	29
,,	Lot No. 4, xiii/24, B.	1	39
Kuruman	Maneman Reserve	1	Unknown
Mafeking	Signal Hill	18	,,
Uitenhage	Matjesfontein	7	303
Upington	Upington	1	Unknown
Vryburg	Progress Farm	1	,,

East Coast Fever.

District.	Area.	Number of Animals Sick.	Number of Animals Died or Destroyed.	Number of Animals In-contact.
East London	Cintsa, Ward 7	Unknown	2	9000
,,	Paardekraal, Section 2, Ward 7	,,	1	55
,,	Lot No. 18, Ward 7	,,	1	Unknown

Glanders.

District.	Area.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number In-contact Animals Tested.
Cape................	Bellville.............	1	Nil	4
,, ...	Maitland.............	Nil	1	3
,, ...	Salt River...........	Nil	1	2
Kingwilliamstown.....	Wouldby............	Nil	1	4
Victoria East.........	Olive Park, Alice.....	Nil	1	Unknown

Lung-sickness.

District.	Area.	Number of Animals Died or Destroyed.	Number of Animals In-contact.
Stockenstroom............	Cathcart Vale................	2 (old lungers)	Unknown

Scabies (Equine).

District.	Area.	Number Animals Affected.	Number In-contact Animals.
Cape....................	Wynberg...................	1	Nil

Tuberculosis.

District.	Area.	Number of Animals Tested.	Number Reactions to Test and Destroyed.	Number of Doubtful Reactions to be Retested.
Cape................	Various.............	153	4	2
Malmesbury..........	,, ...	79	Nil	Nil
Paarl................	,, ...	39	4	1
Stellenbosch..........	,, ...	50	1	Nil

TRANSKEI TERRITORIES.

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts
Flagstaff.................	Commonage..................	1	215
,, ...	Ntlenzi's Location............	1	15
,, ...	Umzimhlawa Drift............	1	51
,, ...	Nyisane's Location...........	1	42
,, ...	Rolobile's Location...........	2	34
,, ...	Njekelana's Location..........	1	15
,, ...	Langa's Location.............	1	65

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Willowvale..............	Dumalisiles' Location.........	16	173
,, ...	Nelani Boois..................	4	586
,, ...	Bishop Manxiwa.............	6	146
,, ...	Boms.......................	1	331
,, ...	Matumbu's Location..........	—	—
,, ...	Bangenis' Location...........	—	—
,, ...	Jekem's Location.............	—	—
,, ...	Ubikitsha's Location..........	—	—
Kentani.................	Somana's Location............	1	3
,, ...	Ngquleni Location............	—	—
,, ...	Ntapana's Location...........	1	15
,, ...	Nyamani's Location..........	2	—
Idutywa.................	Poswa's Location............	1	150
,, ...	Munyu Outspan.............	1	15
,, ...	Commonage................	1	15
,, ...	Bangisos Location...........	1	—
,, ...	Mqekis Location.............	1	218
,, ...	Bashee Bridge, A. T. Wood....	1	15
Bizana..................	Mbono's Location............	9	213
,, ...	Jama's Location..............	2	49
,, ...	Langasike's Location..........	10	13
,, ...	Fungu's Location............	1	117
,, ...	Magquzumana's Location......	1	51
,, ...	Gazulu's Location............	—	—
Butterworth..............	Mcubukazi Outspan..........	1	15
Engcobo................	Langa's Location.............	3	29
,, ...	Vetus Location..............	—	—
,, ...	Silinclas Location............	—	—
Libode..................	Manyangaza's Location.......	49	170
,, ...	Sovala's Location............	—	—
Lusikisiki................	Bodwenis Location...........	4	99
,, ...	Mlembeleles Location.........	1	20
,, ...	Jwaqus Location.............	1	18
Umtata..................	Hillside.....................	1	63
,, ...	Balizulus Location...........	—	—
Mount Frere.............	Ntuta's Location.............	1	33
,, ...	Tabankulu Commonage.......	—	—
Umzimkulu..............	Silwangana's Location........	—	—
,, ...	Rustfontein..................	—	—
,, ...	Sneezewood.................	—	—

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Mount Frere.............	Mouzis Location.............	1	18
Talanga..................	Gazelas Farm Mdula..........	5	—
Umtata..................	Golondwand's Location........	2	—
Idutywa.................	Zangqingquis Location........	1	—

Glanders.

District.	Name of Farm.	Clinically Destroyed.	Reacted. Destroyed.	Contacts Tested.
Umtata............	Town................	1	—	—

Lung-sickness.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Engcobo..................	Mhletywa's Location..........	2	83
Kentani..................	Fenns......................	1	58
Lusikisiki................	Amos Location...............	1	49

NATAL.

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Alexandra...............	Dinguland..................	7	94
,, ...	Oban.......................	5	52
,, ...	Lot No. 3..................	—	—
Alfred..................	Rydal Mount................	3	102
,, ...	Fordown....................	—	—
,, ...	Magee......................	—	—
,, ...	Tindale Farm...............	—	—
,, ...	Shennington................	—	—
,, ...	Connemara..................	—	—
,, ...	Ballyroon..................	—	—
Bergville................	Cavern Falls...............	—	—
,, ...	Bellvue....................	—	—
,, ...	Woodstock..................	—	—
Dundee	Lincoln....................	—	—
,, ...	Carolina...................	—	—
Estcourt................	Oatlands...................	4	44
Ixopo..................	Gunningate.................	—	—
,, ...	Location No. 7.............	—	—
,, ...	Location No. 8.............	—	—
Klip River..............	Willkleinfontein...........	1	75
Lower Umzimkulu........	Speculation................	—	—
Ngotshe................	Ontevreden.................	—	—
Paulpietersburg.	Town Lands.................	2	123
Maritzburg..............	Mayor's Walk...............	—	—
Umvoti..................	Schoongezicht..............	—	—
Utrecht.................	Zandspruit.................	—	—
,, ...	Gumtree Grove..............	—	—
,, ...	Bergenoeg..................	—	—
,, ...	Tuschenbei.................	—	—
Upper Umkomanzi.......	Salt Pans Vlei.............	—	—
Vryheid.................	Town Lands.................	—	—
Zululand................	Reserve No. 17.............	1	10
Weenen.................	Bellevue...................	7	9

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Lions River..	Allerthorpe	1	—
Umgeni...	Braeburn	1	200
Estcourt	Misgunst	1	150

Epizootic Lymphangitis.

Inanda	Inanda Tea Co.	2	6
Estcourt	Crompton Fold	1	1

Glanders.

District.	Name of Farm.	Clinically Destroyed.	Reacted. Destroyed.	Contacts Tested.
Newcastle	Leopards Kloof	1	2	7
,,	Blackmore	1	—	—

Tuberculosis.

District.	Name of Farm.	Number of Animals Tested.	Number of Reactions.	Number of Doubtful Reactions.
Umlazi	Codemore	—	—	—
Lions River	Riversfield	44	Nil	Nil

TRANSVAAL.

Lung-sickness.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Krugersdorp	Hartebeestfontein No. 118	1	—
Heidelberg	Bronkhorstfontein No. 294	1	—

Anthrax.

Heidelberg	Witkoppies No. 116	1	—
Pretoria	Hoekplaats No. 601	1	—
Lichtenburg	Police Camp	1	—

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of Contacts Tested.
Middelburg...........	Town................	—	1	12
Witwatersrand.......	16 Gordon Road, Bertrams	—	1	—
"	Von Brandis Street...	1	—	—
"	Avenue Road........	—	—	—
Bethal..............	Weltevreden No. 139..	1	—	6

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Piet Retief........	Madola No. 46..............	1	—

Tuberculosis.

District.	Name of Farm.	Number of Animals Tested.	Number of Reactions.	Number of Doubtful Reactions.
Pretoria.............	Rankin Bros.' slaughter-poles	(Animal discovered at slaughter-poles).		

Epizootic Lymphangitis.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Krugersdorp.............	Burghershoof................	1	—

ORANGE FREE STATE.

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Kroonstad................	Besterskraal.................	1	—
Bloemfontein.............	Alsemfontein...............	1	—

Glanders.

District.	Farm or Place.	Clinically Destroyed.	Reacted. Destroyed.	Contacts Tested.
Vrede...............	Driekoppen..........	—	1	9

Important Notice to Sheep Breeders.

Arrangements are being made for one of the Government Sheep and Wool Experts, who is proceeding to Australia, to purchase sheep for those farmers who are desirous of importing pure-bred stock for the improvement of their flocks.

Intending purchasers should make early application to the Chief, Division of Sheep, Pretoria, stating exactly what their requirements will be, and the prices they are prepared to pay. The amount involved must be deposited with the Department before the Expert leaves for Australia (i.e. the 29th April).

Agricultural Show Dates, 1912.

NATAL PROVINCE.

Newcastle.—Thursday and Friday, 6th and 7th June.
Vryheid.—Tuesday, 11th June.
Dundee.—Thursday and Friday, 13th and 14th June.
Klip River (Ladysmith).—Tuesday and Wednesday, 18th and 19th June.
Weenen (Estcourt).—Thursday and Friday, 20th and 21st June.
Umvoti (Greytown).—Thursday and Friday, 20th and 21st June.
Lion's River.—Tuesday, 25th June.
Maritzburg.—Thursday, Friday, and Saturday, 27th, 28th, and 29th June.
Durban.—Wednesday, Thursday, and Friday, 3rd, 4th, and 5th July.
Lower Umzimkulu (Port Shepstone).—Tuesday, 9th July.
Stanger.—Wednesday, 10th July.
Camperdown.—Thursday, 25th July.
New Hanover.—Wednesday, 24th July.
Richmond.—Unfixed.
Ixopo.—Thursday, 20th June.
Noodsberg Road.—Unfixed.

TRANSVAAL PROVINCE.

Potchefstroom.—Wednesday, 24th April.
Wolmaransstad.—Wednesday, 15th May.

NOTE.—The Lydenburg Society has decided not to hold a Show this year.

ORANGE FREE STATE PROVINCE.

Bloemfontein.—Tuesday, Wednesday, and Thursday, 16th, 17th, and 18th April.

Farm Employment.

Young man, 25 years of age, seeks employment as foreman or general working man on a farm. Sober, strong, healthy, not afraid of work. Knowledge of mixed farming; testimonials. Speaks Dutch and English.—G. J. ROSSOUW, c/o H. Vaughan-Williams, Driefontein, Clocolan, O.F.S. [1]

Young man seeks employment on farm, with a view to learning farming. Speaks English and Dutch.—V. HAUTEKIET, Nieuport, Bains, Belgium. [2]

Young man seeks employment on farm in order to learn farming.—ELLESMERE ELLIS, P.O. Box 1025, Johannesburg. [4]

South African Produce Markets.

CAPETOWN.

The Produce Department of the firm of R. Müller, Capetown, reports under date of the 26th March, 1912, as follows, viz. :—

Ostrich Feathers.—To-day's cablegrams report a good attendance and satisfactory competition at the ostrich feather sales, which are now being held in London, A total weight of 112,000 lb. is being offered for sale. All wing feathers show a firm tendeney, and the same may be said of byocks, boos, medium and short blacks, medium and short drabs. Long blacks, as well as long drabs, show a decline of 10 per cent. at an average.

The Capetown market proves strong; in fact, exporters experience difficulty in obtaining a sufficient quantity of the special lines, for which they hold orders. There is a special demand for flossy feathers. The following are to day's ruling prices at Capetown, viz :—

	£	s.	d.		£	s.	d.
Primes	18	0	0	to	29	0	0
First	12	10	0	„	17	10	0
Second whites	8	0	0	„	10	10	0
Third whites	3	10	0	„	7	10	0
Inferior and stalky whites	1	5	0	„	3	10	0
Byocks and fancy	2	0	0	„	9	0	0
Superior feminas	10	0	0	„	14	10	0
First feminas	7	10	0	„	9	10	0
Second feminas	4	0	0	„	6	0	0
Third feminas	1	10	0	„	3	15	0
Greys	1	10	0	„	7	0	0
White boos	0	15	0	„	3	0	0
Light boos	0	12	6	„	1	15	0
Dark boos	0	3	0	„	0	15	0
Inferior boos and tipless	0	1	0	„	0	12	6

	£	s.	d.		£	s.	d.
Long blacks	2	10	0	to	7	0	0
Medium blacks	2	0	0	„	3	10	0
Short blacks	0	6	0	„	1	5	0
Long floss black	1	7	6	„	2	10	0
Medium floss black	0	12	6	„	1	5	0
Short floss black	0	7	6	„	0	10	0
Long drabs	2	10	0	„	3	10	0
Medium drabs	0	10	0	„	1	5	0
Short drabs	0	3	0	„	0	7	6
Long floss drabs	1	7	6	„	2	0	0
Medium floss drabs	0	12	6	„	0	17	6
Short floss drabs	0	5	0	„	0	8	0
Inferior long blacks and drabs	0	12	6	„	1	15	0
Common blacks and drabs	0	1	0	„	0	5	0
Spadonas	0	10	0	„	3	0	0

Wool.—Owing to the strike the London wool sale had to be postponed, and it has been decided to open the next London wool sale on the 11th proximo, on which date 273,000 bales will be offered, whereof 21,500 are from the Cape. The local business in wool has been rather restricted. The offerings from Malmesbury and Piquetberg were mostly burry and heavy, and consequently bids did not exceed 4d. to 4⅞d. Roggeveld and Karroo wool fetched 7d. to 7¼d., and C. and C. as much as 5¼d., which must be considered an excellent price. I quote :—

	d.		d.
Long Karoo and Roggeveld, heavy	6	to	6¾
Long Karoo and Roggeveld, light	6¾	„	7½
Long Calvinia	5¾	„	6¼
Short Calvinia	5	„	5½
Short burry wools, heavy	4	„	4¾
Short burry wools, light	4¾	to	5¼
C. and C., grease, best	4¾	„	5¼
C. and C., medium	3½	„	4½
C. and C., inferior	1	„	3

Skins.—The Capetown market for skins continues good. Consignors may at all times be sure that any quantity will find buyers readily at the undermentioned highly satisfactory prices :—

Goatskins, light	13½d. per lb.
Angoras	7d. per lb.
Longwools, Caledon	5½d. per lb.
Longwools, Karoo	5d. per lb.
Pelts and damaged	3d. per lb.
Capes, large	3s. each.
Cape, cut	1s. 3d. each.
Goatskins, heavy	10½d. per lb.
Angoras, bastard	10d. per lb.
Longwools, grasveld	5½d. per lb.
Shortwools	3½d. per lb.
Bastards	4½d. per lb.
Capes, medium	2s. 3d. each.
Small and damaged	7d. each.

PORT ELIZABETH.

Messrs. John Daverin & Co. report as follows under date 29th March :—

Ostrich Feathers.—A good business has been done on the local public feather market since the date of our last report, the sales for the month totalling £61,345. (weight, 263,888 lb.) although on account of the agricultural show, no market has been held during the present week. The main feature of the month's business has been the preference shown to quality. The difference between the demand for superior and common qualities is very wide, and the general trend of the present market is towards a continuance of the active demand for all really good qualities, at the expense of the lower grades. The demand for primes and best feminas has been particularly keen during the past three weeks, and these descriptions have been commanding higher prices than we have seen paid for a considerable time. On the other hand, all ordinary, common, narrow, quilly, and discoloured descriptions—in fact, everything below average in quality, have been neglected and prices have been, if anything, even lower than they were last month.

Long blacks and drabs, with the exception of the best, are lower, and tails generally are rather easier, also floss, but spadonas, especially the top lines, are very firm.

Advices from London state that trade on the Continent has continued very good: and further, that some increase in the buying orders from America has taken place. This latter fact doubtless accounts for the improvement in the demand for superior wings.

The London sales have now closed, and the total results as compared with the rates established at the February sales are as follows :—

Long blacks and drabs	about 5 per cent. lower.
Medium blacks and drabs	about 10 per cent. higher.
Tails in general	about 5 per cent. lower.
Floss in general	about 5 per cent. lower.
Narrow whites and feminas	about 10 per cent. higher.
Third whites and feminas	about 10 per cent higher.
Spadonas	about 15 per cent. higher.
All other descriptions	no change in prices.

The decline on long blacks, drabs, tails, and floss has probably been fully discounted here, as also the improvement on spadonas, but the improvement on common wings which is quoted has not been expected, and may therefore lead to some advance in the prices of these descriptions here. On the other hand, it was generally anticipated that some advance on superior wings would be made, but this as yet is not reported.

Until our market reopens next week, it will not be possible to say how the news will affect prices here, but we quite expect that good qualities will remain firm, and that at last we may see some improvement on the commoner sorts.

In the meantime, the following quotations must be looked upon as more or less nominal :

	Whites.		*Feminas.*	
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Super	8 0 0 to	11 0 0	5 10 0 to	7 10 0
Good	6 0 0 „	7 10 0	4 10 0 „	5 5 0
Average	5 0 0 „	6 0 0	3 0 0 „	4 0 0
Poor average	3 15 0 „	4 10 0	2 0 0 „	3 0 0
Common and inferior	2 15 0 „	3 10 0	1 10 0 „	2 0 0

	Tails.		*Blacks.*		*Drabs.*	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Good to super	12 6 to	25 0	25 0 to	55 0	15 0 to	22 6
Average	7 6 „	10 0	14 0 „	16 0	8 0 „	11 0
Poor	4 0 „	7 0	10 0 „	12 6	5 0 „	7 0

	Spadonas.		*Chicks.*
	s. d.	s. d.	d. s.
Super lots	25 0 to	50 0	6 to 5
Average lots	15 0 „	25 0	
Common	2 6 „	7 6	

Wool.—Notwithstanding the threatening outlook, in consequence of the coal strikes in England, prices have been fairly well maintained throughout the month, although the tone has been less buoyant during the latter part.

All superior parcels realized practically unchanged prices, but heavy, wasty, and burry lots were very much at a discount and, as compared to a month ago, must be quoted ¼d. to ½d. lower.

The labour conditions prevalent at Home are productive of so much uncertainty that it is impossible to forecast future prospects with any degree of certainty, and under these circumstances we would urge our friends up country to act with the greatest caution in buying, to differentiate very carefully as to condition of clips and to pursue the wise policy of going with the market and realizing promptly, in view of the possibility of a sudden collapse in manufacturing centres.

Owing to the agricultural show having been held during the last week of this month there were no public nor catalogue wool sales held during that week, the total offerings on the catalogue sales during the month only amounted to 5656 bales, of which the small proportion of 1392 bales were sold.

The stock of wool held here is comparatively small, comprising as it does about 4000 bales, but unfortunately the bulk is of the heavy and wasty description, which at the best of times is a drug in the market and naturally suffers most in its present depressed state.

The commencement of the London sales, which were to have opened on the 5th March, has been postponed until 11th April, and we understand that the May sales will also be deferred until the middle of June.

The following are more or less nominal quotations for :—

	d.		d.
Snowwhite extra superior	18½	to	19½
„ superior	17	„	18
„ good to superior	16	„	16½
„ inferior faulty	13	„	15
Grease, super long, well-conditioned, grassveld grown (special clips)	9	„	10
Grease, super long, grassveld grown	7½	„	8½
Grease, super long, Karoo grown (special clips)	7½	„	8
Grease, super long, Karoo grown	6¾	„	7½
Grease, super long, mixed veld	6¼	„	7¼
Grease, light, faultless, medium, grassveld grown	6	„	6½
Grease, light, faultless, medium, Karoo grown	6	„	6½
Grease, light, faultless, short, Karoo grown	5¼	„	6
Light Karoo lambs	6	to	6½
Crossbred Grease	5½	„	6½
Crossbred scoured	12½	„	14
Grease, coarse and coloured	4	„	5¼
Scoured, coarse and coloured	3	„	8
Basuto grease, short	5½	„	5¾
O.F.S. grassveld grease, long and well-conditioned (special clips)	7	„	7½
O.F.S. grassveld grease, long and well-conditioned	6	„	6¾
O.F.S. grassveld medium grown, light, with little fault	5½	„	6¼
O.F.S. grassveld short, faulty, and wasty	4	„	5
O.F.S. Karoo grown, long and well-conditioned	6	„	6¼
O.F.S. medium grown, light, with little fault	5	„	5½
O.F.S. short, faulty, and wasty	4	„	4½

Mohair.—We much regret that we are not in a position to report any improvement in this market, in fact at present there are no indications whatsoever to point favourably towards a recovery of the low range of prices which have been established.

Reports from manufacturing circles as to the future of this market are pessimistic, and fashion unfortunately does not favour the article, and it is therefore not beyond the reach of possibility that even lower prices than those nominally current now will have to be accepted in order to effect sales.

The stock held locally is about 3000 bales, made up of about 2000 bales firsts, 750 bales summer kids' hair, and 250 bales mixed.

In the absence of any sales the following are given as nominal quotations :—

	d.		d.
Super kids	19	to	20
Ordinary kids and stained	14	„	16
Superior firsts, special clips	10	„	10½
Ordinary firsts	9¼	„	9½
Short firsts and stained	8½	„	9
Superfine long blue O.F.S. hair	12	„	12½
Mixed O.F.S. hair (average)	9½	„	10½
Mixed O.F.S. hair, very mixed	7	to	9
Seconds and grey	5	„	7½
Locks	4¾	„	5
Winter kids, special clips	13½	„	14
Winter kids, good ordinary	11	„	12
Winter hair, short to full-grown	8	„	8½
Basuto hair	9½	„	10½

EAST LONDON.

Messrs. Malcomess & Co., Ltd., East London, report as follows, under date 29th March :—

Wool.—Since our last report, dated 28th ultimo, was written, events of great importance have taken place in England, and the coal strike, the possibility of which was foreshadowed, has come about. The immediate result has been the greatest crisis of the industrial world that England has gone through. Every branch of trade has been affected—one by one, mill, factory, engineering and shipbuilding yard has been compelled to close its doors for lack of coal, while the railway companies have had to reduce their services, and the terrible stream of unemployed daily grows. Besides nearly a million coal miners, there are several million other workers now affected. At the time of writing there is no chance of immediate peaceful settlement, and Government contemplates legislation.

The wool trade first felt the effect when the second series of the London Colonial wool sales, due to commence on the 5th instant, had to be postponed indefinitely.

For the moment prospects are too uncertain to allow accurate forecast, but cable news received about the middle of the month states that the London sales have been arranged to be held on 11th April, with offerings limited to 250,000 bales.

Bradford stands at much the same level as at the end of February, while the Antwerp sales of River Plate wools, which opened on 27th instant, showed a rise of 2½ per cent. to 5 per cent. It is therefore possible that despite the general crisis London may open unchanged, or even firmer.

Locally there is little difference to report. There was some listlessness, but this was partly due to the indifferent class and condition of goods offered for sale.

In the public auctions—

6th March—2080 bales offered, 550 sold. Sales for the week, 1300 bales.
13th March—2800 bales offered, 500 sold. Sales for the week, 1000 bales.
20th March—1100 bales offered, 250 sold. Sales for the week, 750 bales.
27th March—1700 bales offered, 700 sold. Sales for the week, 1500 bales.

A total, with private sales, of about 5000 bales for the month, leaving stocks at about 10,000 bales.

New Season's Transkeis have been coming down freely during the past week, and the general condition seems to be up to the average, though slightly shorter in bulk than twelve months ago. Some high prices have been paid.

Up-country Wools of the new season are not as yet representative: most lots offered being very snuffy, and for such full values will not be realized.

The bulk of heavy doubtful yielding stocks are likely to remain on hand for some time yet.

We quote :—

	d.		d.
Transkeis	6½	to	7½
Basuto native grease	5	„	6
Ordinary native grease	5	„	5¾
Superior long-skirted Kaffrarian farmers (nominal)	8	„	10¾
Superior short-skirted Kaffrarian farmers (nominal)	7	„	8
Good long grassveld, well-conditioned (nominal)	6	„	8
Good short grassveld, well-conditioned	5	to	6¾
Long northern O.F.S.	6	„	7½
Long southern O.F.S.	4	„	6
Short faulty grease	4	„	5½
Coarse and coloured	2½	„	4¾

Mohair.—This market remains very quiet, and we have to mark prices down somewhat.

Spinners at home are hung up by the coal crisis. Stocks of strong hair at Home are large without any demand, and spinners expect a *heavy decline* when the new season's supplies come to hand and increase available quantities still further.

We quote :—

	d.		d.
Superior kids	14	to	16
Average kids	12	„	13½
Winter kids	10	„	12
Winter hair	7	„	8½
Superior long blue	11	„	12
Average long blue	9½	to	10½
Mixed O.F.S.	9	„	10
Seconds and greys	5	„	6
Thirds	4½	„	5
Basuto	9	„	10½

These valuations are absolutely nominal, and the prices are not always obtainable.

Sundry Produce.—The goatskin market has come down considerably, and in this line we must quote much lower. Hides are about the same, and sheepskins a shade lower. Hides, S.D. 9½d. to 9¾d.; D.S. 7¾d. to 8¼d. Goats, 11½d. Angoras, 9d. Sheep, woolled skins, 4½d.; coarse woolled, 4d.; pelts, 2½d. to 2¾d.; Transkei parcels, 3½d.

DURBAN

Reid & Acutt's Wool Mart, Ltd., Esplanade, Durban, report as follows under date 29th March, 1912:—

The past month has been rather a quiet one in the trade here, long wools being practically finished for the season, and short and lambs' wools not having yet come forward in any quantity.

The second series of London auctions which were due to commence on 5th instant have been postponed until the 11th proximo owing to labour trouble at Home, and this has naturally caused a marked degree of uncertainty as to values, which has reacted on the market.

On our auctions during the month supplies have been small, but in spite of the dull state of the market all long, well grown, shafty lots remain in fairly good demand, and invariably realize full rates.

We are pleased to be able to advise that on our auction this week a much healthier tone was disclosed; competition was brisk, and prices all round exhibited a harder tendency. The demand was chiefly directed towards light-conditioned short and lambs' wools from the northern districts of Natal, these classes changing hands at distinctly improved prices.

Our London friends advise that there has so far been no weakening in the market there, but owing to the fact that many of the manufacturers are working short time owing to the lack of coal, it is exceedingly difficult to gauge the true state of the market, and this will be so until the London sales open on the 11th proximo.

The quantity of wool held over here is not large, and consists almost solely of heavy-conditioned, fatty clips, for which sellers' ideas are still too high.

Coarse and coloured is in good demand at very firm rates.

Mohair.—This article continues dull and difficult of sale, supplies being small, our quotations being in many instances nominal.

The following are prices current here to-day for wool, mohair, etc.:—

NATAL AND EAST GRIQUALAND.

Midlands (nominal).	d.		d.
Long light sorted clips	10	to	11½
Unsorted clips, light and clean	8½	„	10
Short to medium lambs	6	„	7
Medium to long lambs	7	„	8

Ladysmith, Newcastle, Dundee, etc.	d.		d.
12 months' sorted clips, light and clean	8	to	8½
12 months' average clips, light and clean	7	„	7¼
6 to 9 months' average clips, light and clean	5½	„	6½
Short to medium lambs	5¾	„	6½
Medium to long lambs	6½	„	7¼

Utrecht and Vryheid.	d.		d.
12 months' sorted clips, light and clean	7¼	to	8¼
12 months' average clips, light and clean	6¾	„	7¼
6 to 9 months' average clips, light and clean	5¼	„	6¼
Short to medium lambs	5½	„	6½
Medium to long lambs	6½	„	7½

East Griqualand.	d.		d.
12 months' sorted clips, light and clean	7¾	„	8¼
12 months' average clips, light and clean	7	„	7½
6 to 9 months' average clips, light and clean	5½	„	6¼
Short to medium lambs	5½	„	6½
Medium to long lambs	6¼	„	7

TRANSVAAL.

Volksrust, Wakkerstroom, Ermelo, Amersfoort, etc.	d.		d.
12 months' sorted clips, light and clean	7½	to	8¼
12 months' average clips, light and clean	6¾	„	7¼
6 to 9 months' average clips, light and clean	5¼	„	6½
Short to medium lambs	5½	„	6½
Medium to long lambs	6½	„	7½

Standerton, Bethal, Middelburg, etc.	d.		d.
12 months' sorted clips, light and clean	7	„	7½
12 months' average clips, light and clean	6¼	„	6¾
6 to 9 months' average clips, light and clean	5	„	6¼
Short to medium lambs	5¼	„	6¼
Medium to long lambs	6	„	6¾

Heidelberg, Pretoria, Potchefstroom, Klerksdorp, Lichtenburg, etc.	d.		d.
12 months' sorted clips, light and clean	6¾	„	7¼
12 months' average clips, light and clean	5¾	„	6½
6 to 9 months' average clips, light and clean	5	„	6
Short to medium lambs	5¼	„	6
Medium to long lambs	5¾	„	6½

ORANGE FREE STATE.

Harrismith, Vrede, Bethlehem, Heilbron, etc.	d.		d.
12 months' sorted clips, light and clean	7½	to	8¼
12 months' average clips, light and clean	6½	„	7¼
6 to 9 months' average clips, light and clean	5½	„	6½
Short to medium lambs	5¼	„	6½
Medium to long lambs	6½	„	7

Lindley, Kroonstad, Vredefort, Parys, etc.	d.		d.
12 months' sorted clips, light and clean	7	„	8
12 months' average clips, light and clean	6¼	„	6¾
6 to 9 months' average clips, light and clean	5	„	6
Short to medium lambs	5¼	„	6
Medium to long lambs	5¾	„	6½

Senekal, Ficksburg, Ladybrand, Winburg, etc.	d.		d.
12 months' sorted clips, light and clean	7	„	7¾
12 months' average clips, light and clean	6¼	„	6¾
6 to 9 months' average clips, light and clean	5	„	5¾
Short to medium lambs	5	„	5¾
Medium to long lambs	5½	„	6¼

Coarse and Coloured.			
Free from kemps	4	„	5
Ordinary	3	„	4
Inferior, kempy, and Persian	1	„	2

BASUTOLAND AND NATIVE WOOLS.

	d.		d.
Superior lots, light and clean	5½	to	6½
Average lots, light and clean	4¾	„	5¼
Average lots, heavy and wasty	4	to	4¾

MOHAIR.

	d.		d.
Kids, good length, and super quality	13	to	14
Long blue, super quality	11	„	12
Long blue, average	9½	„	10½
Ordinary lots	8	to	
Short and mixed winter	7	„	8
Inferior and coloured	4	„	6

BASUTOLAND AND NATIVE MOHAIR.

	d.		d.
Average lots, mixed quality	9	to	10
Average lots, inferior	6	to	8

HIDES, SKINS, HORNS, AND BARK.

Hides.—Sundried, 14 to 20 lb. average, 8d. to 8¾d. per lb.; sundried, inferior, 5d. to 7d.; salted, 6½d. to 7½d.

Sheepskins.—Long-woolled, 4¼d. to 4¾d. per lb.; short-woolled, 3d. to 4d. Pelts, 1d. to 2½d.; coarse and coloured, 2d. to 3½d.; salted, heavy, 3½d. to 4d.

Goatskins.—Mixed parcels, sound, 3d. to 4d. per lb.; inferior, 1d. to 2½d.

Horns.—3d. to 10d. per pair.

Wattle Bark.—Cut and bagged, good colour and quality, 5s. 6d. to 6s. per cwt.; cut and bagged, inferior colour and quality, 4s. 6d. to 5s.; uncut in bundles, good colour and quality, 4s. to 5s.; uncut in bundles, inferior colour and quality, 2s. to 4s.

Current Market Rates of Agricultural Produce and Stock.

The following Table of Current Market Rates of Agricultural Produce and Live Stock on Saturday, 30th March, 1912, ruling at the several Centres named, is published for general information.

Centre.	A. Wheat per 100 lb.	B. Wheat Flour per 100 lb.	C. Boer Meal per 100 lb.	D. Mealies per 100 lb.	E. Mealie Meal per 100 lb.	F. Barley per 100 lb.	G. Oats per 100 lb.	H. Oat-hay per 100 lb.	J. Lucerne Hay per 100 lb.	K. Potatoes per 100 lb.	L. Tobacco (Boer Roll) per lb.	M. Beef per lb.	N. Mutton per lb.	O. Fresh Butter per lb.	P. Eggs per dozen.	Q. Cattle (Slaughter).	R. Sheep (Slaughter).	S. Pigs.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.	s. d.	£ s. d.
Cape Province:																		
Aliwal North ...	9 0	21 6	12 0	5 6	7 0	8 0	8 6	4 3	3 6	5 0	1 0	0 6	0 5	1 6	1 0	10 10 0	15 0	*2 0 0
Beaufort West ...	7 6	15 6	10 3	7 6	8 6	8 6	7 0	4 6	4 0	9 6	1 0	0 5	0 5	1 3	1 3	12 0 0	12 0	4 0 0
Capetown ...	—	—	—	6 7	—	7 6	6 6	4 0	5 4	9 6	†0 6½	—	—	1 3	1 9	—	—	—
East London ...	9 0	18 0	29 0	7 0	13 0	6 0	5 6	4 0	5 0	6 6	1 0	0 5	0 6	1 5	2 6	15 0 0	20 0	—
Grahamstown ...	8 0	—	—	6 9	—	4 4	7 0	4 2	—	11 9	0 8	0 5	0 5	2 2½	1 11	—	—	2 2 0
Kimberley ...	8 0	13 0	11 0	6 6	6 9	7 0	7 0	4 0	4 0	11 0	0 5	0 6	0 4½	1 0	1 9	12 0 0	15 0	3½d. p. lb.
Kingwilliamstown	7 0	18 0	12 6	5 0	6 6	6 9	8 6	4 0	4 0	11 0	0 11	0 6	0 6	1 0	2 0	14 0 0	19 6	3½d. p. lb.
Port Elizabeth ...	8 6	—	—	7 0	—	4 9	7 6	3 3	—	12 0	0 4½	0 7½	0 7	1 6	2 3	—	—	1 10 0
Queenstown ...	7 3	—	—	7 6	9 6	—	—	—	—	8 6	—	—	—	—	1 9	—	—	—
Natal:																		
Durban ...	—	—	—	4 6	—	—	—	—	—	6 6	—	—	0 3¾	1 2	2 6	—	—	—
Pietermaritzburg	8 0	—	—	6 0	15 0	10 0	6 0	4 0	4 6	6 6	0 4	0 5	0 6½	1 4	2 9	—	—	—
Transvaal:																		
Pretoria ...	‡9 6	—	10 0	5 9	—	8 0	6 0	3 11	—	9 0	0 4	—	—	1 3	§2 9	—	—	3d. p. lb.
Johannesburg ...	7 3	—	8 0	5 4	4 3	8 2	6 8	4 9	4 3	8 8	0 4	—	—	1 3	2 6	—	17 7	3d. p. lb.
Orange Free State:																		
Bloemfontein ...	14 0	—	22 0	11 6	12 6	12 6	7 6	4 0	3 9	10 0	0 9	0 8	0 5	1 3	1 9	—	—	—
Harrismith ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

* Average (£1. 10s. to £2. 10s.). † Average (3d. to 10d.). ‡ Average (9s. to 10s.). § Average (2s. 6d. to 3s.).

Departmental Notices

SALE OF FRUIT TREES BY THE HORTICULTURAL DIVISION.

As in previous years this Division has fruit trees for sale in July next. Many of the varieties were budded with special reference to Transvaal requirements in the way of climate, etc.

There is a good selection of apples, peaches, Japanese plums, and apricots. Orders may be sent in at once for not more than 100 trees; these will be taken in rotation and information will be afforded at the earliest possible date as to whether they can be executed or what proportion of the order can be supplied. Invoices will be dispatched in June, and on receipt of remittance, which must be made before 1st July, the trees will be duly consigned during any part of that month which applicants may select. The price of the trees is as usual, 1s. each, for everything besides apples, which are 1s. 3d. each. Cheques and postal orders should be made payable to the Government Horticulturist, Department of Agriculture, Pretoria. Carriage is payable by the purchaser.

The following are the varieties:—

Plums—
- Kelsey.
- Shiro Smomo.
- Ura Bene.
- Chabot.
- Burbank.
- Satsuma.
- Red Nagate.
- Royal.
- Wickson.
- Chalcot.
- Apple Plum.
- Abdundance.
- Magnate.
- Kerr.
- Sultan.
- Early Golden.
- October Purple.
- Ogan Magate
- Yosobe.

Pears—
- Beurre Superfin.
- Beurre Bosc.
- Louis bon de Jersey.
- Bon Chretien.

Peaches—
- Mamie Ross.
- Dr. Hogg.
- Pallas.
- Belle Bauce.
- Elberta.
- Mountain Rose.

Peaches (contd.)—
- Abec.
- Crimson Galande.
- Peen-to.
- Waldo.
- Brook.
- Jewel.
- Florida Crawford.
- John George.
- Improved Peen-to.
- Angel.

Apples—
- Wemmers Hoek.
- Ohenimuri.
- Lady Carrington.
- Delicious.
- Prince Alfred.
- Colville Blanche.
- Monmouth Pippin.
- Jonathan.
- Roxbury Russet.
- Peasgood Nonsuch.
- York Imperial.
- Versfeld.
- Rome Beauty.
- Keswick Codling.
- Bellfleur.
- Cleopatra.
- Ben Davis.
- Dunn's Seedling.
- Scarlet Nonpareil.
- Nicka Jack.
- Lady's Finger.
- American Lady.

Nectarines—
- Gold Mine.
- Snymans.

Apricots—
- Powell's Late.
- Warwick.
- St. Ambrose.
- Blenheim.
- Early Newcastle.
- Early Cape.
- Bush Peach.
- Kaisha.
- McLea's Late.
- Montgamet.
- Large Early.
- Royal.
- McLea's Early.
- Early Golden.
- Orange.
- Moorpark.
- Pineapple.
- November.
- Breda.
- Oullin's Early.

ANNUAL SALE OF PURE-BRED STOCK.
GOVERNMENT EXPERIMENTAL FARMS, TWEESPRUIT AND GROOTVLEI.

The annual sale of pure-bred stock from the Government Experimental Farms at Tweespruit and Grootvlei will be held at the Show Ground, Bloemfontein, in conjunction with the Central Agricultural Society's sale, on Friday, 19th April, 1912.

The following stock will be offered at public auction without reserve:—

HORSES: Three Thoroughbred Yearling Colts, Two Thoroughbred Mares.

CATTLE: About 30 Young Bulls, including Friesland, Lincoln Red, South Devon, and North Devons; Five Cows, Friesland and Shorthorn.

SHEEP: Fifty Stud Rams, including Wanganella, Tasmanian, and German Rambouillet, also a number of Flock Rams and Ewes.

The above-mentioned stock will be sold to the highest bidder, but must not be taken outside the Union of South Africa. The horses and Friesland and Lincoln Red Cattle may be inspected at Tweespruit; the South Devon, North Devons, and sheep at Grootvlei,

Catalogue and further particulars may be obtained from the Managers of the Farms or from the Auctioneers, Messrs. Fraser & Scott, Bloemfontein.

The Agricultural Journal

OF THE UNION OF SOUTH AFRICA.

Vol. III. MAY, 1912. No. 5.

Issued MONTHLY in English and Dutch by the Department of Agriculture.
Communications to be addressed to the Editor, Department of Agriculture, Box 434, Pretoria.
Telegraphic Address "Bulletin, Pretoria."
Subscriptions should be posted to the Government Printer, Box 373, Pretoria.
Advertising inquiries should be addressed to the Metropolitan Advertising Co., Box 962, Capetown

Cotton.

By W. H. SCHERFFIUS, M.S., Chief Tobacco and Cotton Division, Union of South Africa.

INTRODUCTION.

THE use of cotton fibre is not a discovery of modern times; as far back as history records the doings of the human family we find them using the fibre of plants in the manufacture of clothing. The most ancient traditions of the race stand as proof that they applied the art of weaving long before the earliest historians chronicled this fact

The earliest record of the use of cotton fibre was 800 B.C.; but from the statements made in this record one would conclude that it had been in use for centuries.

The ancient historian, Herodotus, writes of cotton trees growing wild in India, "the fruit of which is a wool exceeding in beauty and goodness that of sheep. The Indians make their clothes of this wool". In speaking of the clothing of Xerxe's army Herodotus again refers to the use of cotton fibre.

Pliny wrote about the cotton plant in India, describing the leaves as being similar to those of the mulberry. He said the inhabitants sowed the seed in the field and gathered crops from which they made linen clothes. Other writers of ancient times spoke of the trees of India upon which grew wool.

From these ancient times, down to the present, we have a broken series of records of the growing and use of cotton fibre. These records show that it was grown in India, China, Japan, Arabia, Egypt, Tyrea, Caldee, Asia Minor, Palestine, Italy, Spain, West Indies, Mexico, Peru, Brazil, United States, and probably other countries not mentioned.

During the last half century the cotton industry has advanced with tremendous rapidity. The United States is far in the lead of other countries in the production, producing about two-thirds of the world's crop. The Continent of Europe leads in the consumption of lint, with Great Britain a close second, the United States third, and India fourth.

For the last forty or fifty years ten to fourteen (southern) States of the United States have practically had control of the output and price of this valuable staple. Some of the factors which have assisted the southern planters in making the United States the principal home of one of the most important crops of the world are long summers, clear skies during the autumn months, mild winters, deep rich soils, and the black man to furnish labour. What advantage has America over South Africa? In many parts of this country we have a climate which appears to be especially suited to cotton production, six or eight months without frost, rainfall during the growing period, and dry weather at harvest time. There are millions of acres of rich virgin soil which has never been robbed of its fertility by the reckless use of man; and thousands of Kaffirs to help do the work when once they are taught to respect labour and to regard it as their duty to provide for themselves and their families. Think what it would mean to this country if the latent energy in the black race was turned into account in South African cotton fields.

Do not misunderstand me. The white people of the country should not sit idly by and expect the Kaffirs to take the initiative in such a movement. The proverbial saying that "an idle brain is the devil's workshop", is too true to need comment. The white population must be the pioneers in this work, they will readily see that the Kaffirs are a valuable adjunct in the advancement of the industry.

Without considering the value of cotton from the growers view point, its economic importance is recognized the world over. It is fast becoming one of the greatest staples in the world's market to supply man with clothing. On account of the cheapness of its production and its hygienic qualities it stands prominent along with silk, wool, and flax.

Less than sixty years ago not as much as 2,000,000 bales of 500 lb. each were produced annually, now something like 20,000,000 bales annually are required to answer the music of the world's spindles. When we stop to consider that it would take three times that amount to protect the human family from the discomforts of heat and cold, and knowing, too, that, in other parts of the world, the lands suited to cotton production are limited, is it any wonder that we should be optimistic about its future in this country?

SOIL SUITED TO COTTON.

When the climatic conditions are favourable for cotton growing, that is to say, warm spring and summer rains, clear mild autumns, long summers and short winters, experience has proved that cotton can be grown on a variety of soils such as black turf or prairie lands, red sandy loam, black sandy loam, clay loam, calcareous soils, and gradations of these. Sandy loams and clay loam uplands in dry seasons usually give light yields.

Clay loams and rich alluvial bottom soils, in wet seasons, have a tendency to develop large stalks with heavy foliage and a small proportion of lint, but with a favourable season they give fine yields of lint. With scant rainfall black turf soil should give the best results. In this connection we should like to emphasize the fact that, generally speaking, we do not recommend irrigation for cotton, though if one has a furrow laid and can lead the water on to the land economically, no doubt, during a dry season, on thirsty soils, it will pay.

Plate No. 1.] [*Photo by H. W. T.*

Two-row Cotton and Mealie Planter at work. Rustenburg Experiment Station.

Plate No. 2.] [*Photo by H. W. T.*

Two-horse Cultivator at work. Rustenburg Experiment Station.

In addition to what has already been said I would like to point out that the soil should be, during the growing period, moist, but not wet. If a soil has a tendency to hold too much water this can be partially remedied by artificial drainage and ridge cultivation. Compact clayey soils are often greatly improved by a heavy application of lime, which mechanically separates the clay particles and renders the soil more friable.

PREPARATION OF THE LANDS.

During winter or early spring, all wood and other waste material should be removed from the soil before it is ploughed. The depth to which the land should be broken depends, to some extent, on the depth of soil. It should be at least eight inches, and twelve inches will be better where the soil is deep. The deeper the land is broken the greater will be its moisture-holding capacity, and at the same time better drainage will be secured. Too much emphasis cannot be placed on thorough preparation of the land before the seed is sown. When the soil is thoroughly pulverized before sowing a better stand and growth of plants is secured and the cultivation is rendered much easier. A good stand is very important with any crop. Few farmers stop to consider what a poor stand in their fields of mealies, tobacco, cotton, and other crops mean. Suppose, for illustration, a farmer has 50 per cent. of a stand of mealies on his lands; when he cultivates those lands half of his labour is absolutely wasted, because it is spent cultivating lands that are not producing anything in return; or to put it another way: every day of ten hours that he spends on such a crop, five hours of that day's work is wasted because it is spent cultivating lands that are carrying no crop. Think what an enormous waste of energy that means; yet I dare say that the average field of mealies in the Transvaal will not average more than 50 per cent. of a stand. Instead of a farmer having fifty acres of mealies with 50 per cent. of a stand he had better plant only twenty-five acres and have approximately a perfect stand; the time and energy that otherwise would be wasted can be spent on something else. This rule applies equally well to cotton.

SOWING GOOD SEED.

Under the sub-head *Preparation of the Lands* we have discussed the importance of having a good stand of plants in the field. Having good seed to sow in order to secure a good stand is of equal importance to that of thorough preparation of the land. There is nothing more disheartening to the farmer who has worked hard thoroughly preparing his lands than to find that the seed sown will not germinate; or that the plants are weak and are capable of producing only a few bolls, and consequently he must reap a very light crop of lint. Such a state of affairs should have been obviated during the previous season by making a careful selection of the best shaped and most prolific plants to propagate the next year. (See Plate No. 3.) He will find that it will pay him to make these selections, just as it pays the mealie farmer to carefully select for planting and breeding purposes the best ears from high yielding varieties.

We are undertaking the maturing of bolls covered with paper bags on a few selected plants, with the hope of purifying the type and increasing the yield. (See Plate No. 4.)

Plate No. 3.] [*Photo by V. C. B.*

Cotton Plant, showing Heavy Fruitage
Barberton Experiment Station.

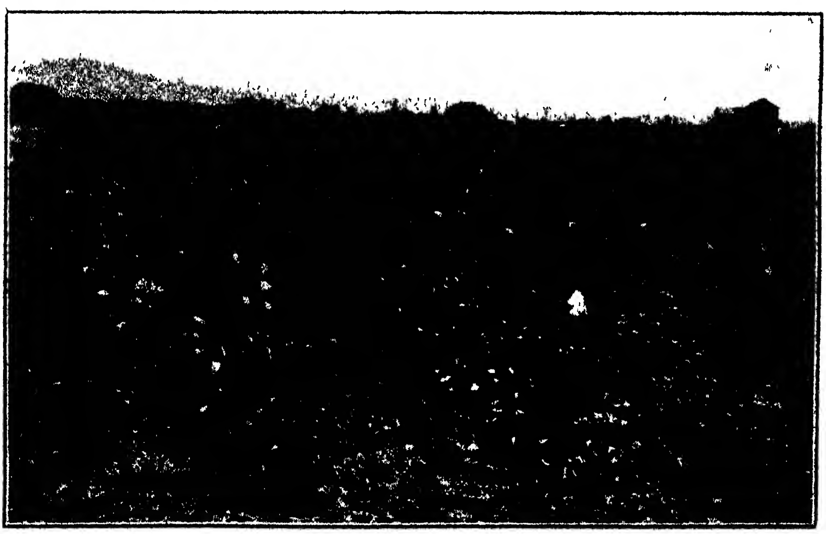


Plate No. 4.] [*Photo by H. W. T.*

Field of Cotton, showing Bolls covered with Paper Bags to prevent Cross-pollination
Rustenburg Experiment Station.

When one decides to go in for cotton growing some of the first questions which naturally arise are:—When is the correct time to sow seed and what variety will be the most profitable for me to grow? The time for sowing is soon after the beginning of the spring rains, usually about 1st November. As to the most profitable variety to grow, this is a question which, in a measure, each farmer must find the answer for himself. The Agricultural Department can only offer suggestions that may be helpful to him in choosing the variety which will be most profitable to cultivate. It must be borne in mind that a variety giving the best results in one locality might, under different soil and climatic conditions, be entirely unsuitable. We should, therefore, not be too hasty in concluding that a certain variety will, on the average, give us the best results. Or if a certain variety gives poor results in a given locality we must not conclude that all varieties will give poor results in that locality. Another factor having an important bearing on the success or failure of a given variety is the condition of the seed. Cotton seed, like other seeds, should be thoroughly acclimatized by being grown for several seasons in the district. Seed brought from another country or district, where they have been grown under different soil or climatic conditions, will in the course of time conform to the rule of adaptation, if the change is not too radical; better results may then be expected. Heredity certainly is an important factor in determining what the plant is going to be like. But, just as in animal life, inherited characteristics or qualities are not so permanently fixed as to maintain themselves when the change of conditions is too radical.

Then there is the important question of having seed to sow that has been normally matured, dried, and properly stored. When this has been done the seed can be kept for a long time without any serious damage to them. Frequently seed carrying a high percentage of moisture is put in bulk, and as a result of heating, the germs of the grains are either destroyed or greatly reduced in vitality. In cold countries, when the seed possesses too much moisture, say 16 per cent. to 20 per cent., the water contained in them becomes frozen; thereby either killing the germs of the grains or greatly reducing their germinating power. If such seed is planted the best we can hope for are plants low in vitality. You can no more expect such weaklings to produce a strong progeny than you would expect the children of invalid parents to become strong healthy men. There is no disputing the fact that "Like tends to produce like". This holds true just as consistently in plant life as it does in animal life, and knowing this, is it saying too much to state that seeds from selected plants bearing heavy fruitage will, under normal conditions, give a better yield than those from plants bearing a light fruitage?

In other countries where cotton growing has become an industry these questions have been made a study and conditions adjusted to overcome the difficulties.

VARIETY TESTS.

The only reliable method of determining accurately which variety of cotton is best suited in a certain district or on a certain soil, is to run a variety test of the most promising varieties for several seasons. Government Experiment Stations and private individuals in other countries have been carrying on experiments of this nature for many years, and as a result of the information thus gained, they have been

able to eliminate a large number of varieties from further consideration, in certain districts.

The South African Government is conducting a series of these field experiments with American Uplands, Sea Island, Egyptian, and Caravonica varieties at Tzaneen, Rustenburg, Barberton, Piet Retief, East London, and other parts of South Africa. (See Table 1.) The results obtained at these stations have been sufficiently encouraging, with the American types, to induce a number of farmers to begin growing cotton on a commercial scale. Local conditions have an important bearing on cotton production, therefore planters should not depend solely on the Government experiments, but, as far as practicable, each one should run a series of experiments for himself similar to these conducted by the Government. In running such a variety test, the farmer should not depend on casual observations to determine which is the best variety to grow for he is liable to be deceived. A variety may grow to a height of 6 or 8 feet, which would be an attractive growth to look at, but the yield of cotton might be very light. The best yields are usually obtained from trees $3\frac{1}{2}$ to $4\frac{1}{2}$ feet high. It is therefore important at picking time that each variety in the experimental plot should be picked, weighed, and ginned separately; the lint and seed should then be weighed. From these results calculations may be made which will show the most profitable variety to grow.

Tests made here of the yield of seed cotton produced from a given number of selected bolls compare favourably with those of any cotton country. In 1910 at our Rustenburg Station we obtained one pound of seed cotton from forty-three bolls,* and last season we had eight varieties to come under this record, the lowest being thirty-four bolls to produce one pound of seed cotton. In a similar test made and reported at the North Carolina, United States of America, Experiment Station in 1907, out of forty-five varieties, the least number required to give a pound of seed cotton was fifty-eight, and the greatest number required was ninety-two. This is very encouraging to us, as well as an indication of the possibilities of the cotton industry in South Africa.

The amount of seed cotton produced from the various pickings should be taken into consideration in determining which is the most suitable variety to grow. It is frequently the case that a certain variety will show splendid results from the first picking, but in subsequent pickings it will not maintain the yield as compared with other varieties. Again, the variety showing the highest total yield for the season might produce most of its seed cotton in the final picking; and still it would be an undesirable variety to select, for being late in producing the principal picking there is the risk of frosts.

It requires from three to four pickings to get all of the cotton off of the stalks. The best cotton is usually gathered at the second picking, and consequently the seed for next year's crop should be, as a rule, selected from the second picking. If, however, it is desirable to establish an earlier maturing variety, then the seed from the first picking should be sown.

There is no fixed rule as to how much cotton may be picked at each picking, as early or late maturity and climatic conditions may materially alter the results, and these results may vary from season to season.

* *Transvaal Agricultural Journal*, No. 32, p. 647.

Table 1.

Variety Tests.

Date of Planting.	Place.	Variety.	Average height in inches.	Average No. bolls to Stalks.	No. of Plants for perfect stand.	No. of Plants by actual count.	No. of bolls for 1 lb. Seed Cotton. Selected.	No. of bolls for 1 lb. Seed Cotton. As found.	Yield in pounds of Seed Cotton. First Picking.	Second Picking.	Third Picking.	Total Picking per plot	Yield per acre.	Pounds Lint per acre.	Pounds of Seed produced per acre.	Percentage of Lint.	Loss in pounds from ginning.	Value of Lint per acre at 5d. per lb. £ s. d.	Value of Seed at 5s. per 100 lb. £ s. d.	Total Estimated Value of Seed and Lint per acre. £ s. d.	Remarks.	
1/12/9	Tzaneen..	Cleveland Big Boll.	46	29	3528	2160	70	—	99	111	38	248	496	152	322	30·6	22	3 3 4	0 16 1	3 19 5	One-half acre in plot.	
..	..	Pullnot..........	41	26	,,	2520	72	—	77	119	40	236	472	136	318	29·2	18	2 16 8	0 15 11	3 12 7	..	
..	..	Tooles No. 6.......	41	27	..	2574	72	—	127	131	28	296	592	194	334	32·8	64	4 0 10	0 16 8	4 17 6	..	
..	..	Doughtys Big Boll.	45	32	,,	1854	67	—	105	95	23	223	446	126	308	28·2	12	2 12 6	0 15 4	3 7 10	..	
..	..	Truitts Big Boll....	37	34	..	2082	58	—	74	89	30	193	386	116	264	30·0	6	2 8 4	0 13 2	3 1 6	..	
..	..	Christopher........	34	45	..	1914	58	—	99	102	30	231	462	138	304	29·2	20	2 17 6	0 15 2	3 12 8	..	
..	..	Upland Short Staple	43	33	,,	2466	80	—	129	110	20	259	518	166	312	32·0	40	3 9 2	0 15 6	4 4 8	..	
..	..	Herlong...........	41	29	..	2592	58	—	101	92	24	217	434	120	284	27·6	30	2 10 0	0 14 2	3 4 2	..	
..	..	Florodora..........	43	21	..	2562	90	—	108	70	12	190	380	102	258	26·8	20	2 2 6	0 12 9	2 15 3	..	
..	..	Bancroft....... ...	40	30	..	2448	65	—	102	100	19	221	442	126	296	28·5	20	2 12 6	0 14 8	3 7 2	..	
..	..	Sunflower..........	50	35	,,	2214	80	—	114	92	12	218	436	114	304	25·7	18	2 7 6	0 15 2	3 2 8	..	
..	..	Griffins No. 5	45	24	..	2490	87	—	114	90	11	215	430	122	278	28·4	30	2 10 10	0 13 9	3 4 7	..	
..	..	Layton............	38	30	,,	2406	87	—	102	90	13	205	410	134	260	32·7	16	2 15 10	0 13 0	3 8 10	..	
..	..	Columbia..........	39	34	,,	1692	90	—	109	78	12	199	398	112	272	28·1	14	2 6 8	0 13 6	3 0 2	..	
..	..	Black Rattler......	41	25	,,	2286	90	—	124	74	13	211	422	106	274	27·1	42	2 4 2	0 13 7	2 17 9	..	
..	..	Russells Big Boll...	39	33	..	2760	75	—	125	87	14	226	452	126	278	27·9	18	2 12 6	0 13 9	3 6 3	..	
..	..	Allens Improved...	39	22	,,	2412	112	—	91	45	7	143	286	74	208	25·9	4	1 10 10	0 10 4	2 1 2	..	
..	..	Bohemian..........	35	22	..	2286	112	—	124	76	6	206	412	144	246	34·9	22	3 0 0	0 12 3	3 12 3	..	
..	..	Peterkin..........	34	20	..	2202	80	—	107	84	11	202	404	142	248	35·1	14	2 19 2	0 12 4	3 11 6	..	
..	..	Griffin.	33	17	..	1908	85	—	95	50	8	153	306	80	192	26·1	34	1 13 4	0 9 6	2 2 10	..	
							Sandy Soil.	Turf Soil.														
26/10/9	Rustenburg	Doughtys Big Boll.	16	8	2070	2033	70	74	64·5	—	—	64·5	258	58	176	22·4	28	1 4 2	0 8 9	1 12 11	One-fourth acre.	Badly frosted.
..	..	Florodora..........	19·5	12	,,	1988	70	70	81	—	—	81	324	84	224	25·9	16	1 15 0	0 11 3	2 6 3	..	..
..	..	Upland Short Staple	18	15	,,	2142	86	78	104	—	—	104	416	132	260	31·7	24	2 15 0	0 13 0	3 8 0	..	..
..	..	Christopher........	37	21	..	2195	57	—	191	—	—	191	764	212	504	27·7	48	4 8 4	1 5 2	5 13 6	..	..
..	..	Layton............	38	22	,,	2260	65	—	195·5	—	—	195·5	782	248	496	31·7	38	5 3 4	1 4 10	6 8 2	..	..
..	..	Herlong......... ...	32·5	31	..	1974	68	52·5	64	145	2·5	211·5	846	236	544	27·9	66	4 18 4	1 7 5	6 5 9	..	..

,,	,,	Bancroft	30·5	32	,,	1820	63·5	56·5	75	148	14	237	948	272	576	28·6	100	5	13	4	1	8	9	7	2	1		
,,	,,	Pullnot	30	29	,,	2065	69·5	52·5	65	144	32	241	964	296	600	30·6	68	6	3	4	1	10	0	7	13	4	,,	,,
,,	,,	Griffins No. 5	36	27	,,	2195	89	77·5	98	132	20	250	1000	272	644	27·2	84	5	13	4	1	12	5	7	5	9	,,	,,
,,	,,	Tooles No. 6	33	34	,,	2170	88·5	80·5	95	167	22	284	1136	380	676	33·4	80	7	18	4	1	13	9	9	12	1	,,	,,
,,	,,	Black Rattler	38·5	31	,,	2142	94	84·5	95	121·5	19	235·5	942	272	580	28·8	90	5	13	4	1	9	0	7	2	4	,,	,,
,,	,,	Russells Big Boll	49	21	,,	2142	50	—	201·5	—	—	201·5	806	216	534	26·7	56	4	10	0	1	6	7	5	16	7	,,	,,
,,	,,	Allens Improved	51	20	,,	2254	62	—	122·5	—	—	122·5	490	101	308	20·6	81	2	2	1	0	15	4	2	17	5	,,	,,
,,	,,	Truitts Short Staple	48	20	,,	2260	52·5	—	166	—	—	166	664	188	440	28·3	36	3	18	4	1	2	0	5	0	4	,,	,,
,,	,,	Peterkin	36	18	,,	2090	61	—	189·5	—	—	189·5	758	244	472	32·2	42	5	1	8	1	3	8	6	5	4	,,	,,
,,	,,	Sunflower	38	18	,,	2270	65	—	151·5	—	—	151·5	606	156	412	25·7	38	3	5	0	1	0	6	4	5	6	,,	,,
,,	,,	Cooks Long Staple	28	16	,,	2046	92	91	72	—	—	72	288	68	204	23·6	16	1	8	4	0	10	2	1	18	6	,,	,,
,,	,,	Bohemian	21	22	,,	1952	—	—	85	—	—	85	412	128	240	31·1	44	2	13	4	0	12	0	3	5	4	,,	,,
,,	,,	Columbia	39	20	1228	1182	54·5	—	92	—	—	92	644	133	280	20·6	—	2	15	5	0	14	0	3	9	5	One-seventh acre.	,,
,,	,,	Cleveland Big Boll	31	26	2070	2262	74	64	61·5	135	5·5	202	808	260	492	32·1	56	5	8	4	1	4	7	6	12	11	One-fourth acre.	,,
							Se-l'ct'd	As f'nd.																				
28/10/10	,,	Columbia	28	—	1548	1362	60	71	37·5	34	—	71·5	286	89	186	31·1	11	1	17	1	0	9	4	2	6	5		
,,	,,	Florodora	31	—	,,	1104	73	84	27·5	29	—	56·5	226	84	134	37·1	8	1	15	0	0	6	8	2	1	8	,,	
,,	,,	Sunflower	34	—	,,	1044	79	88	34	36	—	70	280	80	176	28·6	24	1	13	4	0	8	9	2	2	1	,,	
,,	,,	Griffins No. 5	30·5	—	,,	918	72	83	39·5	38	—	77·5	310	104	196	33·5	10	2	3	4	0	9	8	2	12	0	,,	
,,	,,	Black Rattler	35	—	,,	1410	74	88	89	45	—	134	536	168	362	31·5	6	3	10	0	0	18	1	4	8	1	,,	
,,	,,	Allens Improved	39·5	—	,,	1206	66	70	28·5	30·5	—	59	236	76	152	32·2	8	1	11	8	0	7	7	1	19	3	,,	
,,	,,	Cooks Long Staple	37	—	,,	1482	64	73	16	28	—	44	176	62	112	35·2	2	1	5	10	0	5	7	1	11	5	,,	
,,	,,	Upland Short Staple	33	—	,,	1254	73	83	36	33	—	69	276	81	185	29·3	10	1	13	9	0	9	4	2	3	1	,,	
,,	,,	Layton	34	—	,,	978	64	72	62	39	—	101	404	110	289	27·2	5	2	5	10	0	14	5	3	0	3	,,	
,,	,,	Tooles No. 6	28·5	—	,,	1620	74	86	72·5	34	—	106·5	426	152	270	35·7	4	3	3	4	0	13	6	3	16	10	,,	
,,	,,	Peterkin	33	—	,,	1460	76	87	29·5	35·5	—	65	260	68	182	26·1	10	1	8	4	0	9	2	1	17	6	,,	
,,	,,	Doughtys Big Boll	36	—	,,	1098	64	80	59·5	20	—	79·5	318	79	232	24·7	9	1	12	11	0	11	7	2	4	6	,,	
,,	,,	Christopher	39·5	—	,,	1368	38	44	207·5	47·5	23·5	278·5	1114	413	704	37·0	—	8	12	1	1	15	2	10	7	3	,,	
,,	,,	Cleveland Big Boll	39·5	—	,,	1716	34	48	242·5	28	11·5	282	1128	408	796	36·1	—	8	10	0	1	19	9	10	9	9	,,	
,,	,,	Herlong	40	—	,,	1320	36	52	318·5	37·5	18	374	1496	484	959	32·3	53	10	1	8	2	7	11	12	9	7	,,	
,,	,,	Bancroft	40	—	4128	4112	34	45	849	60	17·5	926·5	1390	445	908	32·0	35	9	5	5	2	5	4	11	10	9	Two-thirds acre.	
,,	,,	Pullnot	37	—	1548	1314	36	49	354	23·5	—	377·5	1510	524	952	34·0	34	10	18	4	2	7	7	13	5	11	One-fourth acre.	
,,	,,	Truitts Big Boll	42	—	,,	1356	36	47	274·5	14	—	288·5	1154	364	788	31·5	2	7	11	8	1	19	5	9	11	1		Frost after the third picking
,,	,,	Russells Big Boll	37	—	,,	1650	35	51	406	15	—	421	1684	544	1120	32·3	20	11	6	8	2	16	0	14	2	8	,,	
,,	,,	Bohemian	35·5	—	,,	1398	37	53	305	—	—	305	1220	440	762	36·0	18	9	0	4	1	18	1	10	18	5	,,	,,
3/12/9	Barberton	Doughtys Big Boll	51	81	2080	1921	58	—	45	149	123	317	1268	324	878	25·5	66	6	15	0	2	3	11	8	18	11	,,	,,
,,	,,	Griffins No. 5	70	86	,,	1993	62	—	42	134	133	309	1236	284	866	23·0	86	5	18	4	2	3	3	8	1	7	,,	,,
,,	,,	Black Rattler	60	66	,,	1800	72	—	50	109	113	272	1088	288	797	26·4	3	6	0	0	1	19	10	7	19	10	,,	,,
,,	,,	Russells Big Boll	50	66	,,	1920	54	—	78	140	—	218	872	248	602	28·4	22	5	3	4	1	10	1	6	13	5	,,	,,
,,	,,	Allens Improved	62	79	,,	1974	72	—	116	66	—	182	728	160	526	22·0	42	3	6	8	1	6	3	4	12	11	,,	,,
4/12/9	,,	Truitts Big Boll	50	76	,,	1766	65	—	75	112	—	187	748	188	510	25·1	50	3	18	4	1	5	6	5	3	10	,,	,,
,,	,,	Sunflower	53	74	,,	1875	68	—	80	99	81	260	1040	240	738	23·1	62	5	0	0	1	16	11	6	16	11	,,	,,
,,	,,	Cooks Long Staple	50	67	,,	1941	53	—	75	122	106	303	1212	322	824	26·5	66	6	14	2	2	1	2	8	15	4	,,	,,
,,	,,	Columbia	51	68	,,	1912	56	—	57	121	72	250	1000	284	690	28·4	26	5	18	4	1	14	6	7	12	10	,,	,,
,,	,,	Bohemian	48	76	1760	1610	73	—	37	39	38	114	456	147	286	32·2	23	3	1	3	0	14	3	3	15	6	,,	,,

A field producing a total of 1000 lb. of seed cotton per acre, under normal conditions, might be expected to yield approximately:—

First picking, from 350 to 400 lb.
Second picking, from 400 to 450 lb.
Third picking, from 150 to 200 lb.

Cotton should be a good paying crop with this yield; in fact with labour well organized and ginning and transport facilities improved cotton can be made to pay with a yield of 600 to 700 lb. per acre of seed cotton. The average yield per acre in the United States is a little less than 600 lb.

In a variety test, where some of the better varieties would yield as much as indicated above, other less suited varieties under the same conditions would not yield more than half that quantity. The reason for this is usually caused by the variety being one producing a small number of bolls to the plant or on account of a poor stand. With a good stand of plants, and each one carrying on the average 50 to 75 bolls, one could calculate on gathering a bale of 500 lb. of lint per acre. Compare the profit thus obtained with that from a poor yield of 150 to 200 lb. of lint per acre, as at present made by some of our farmers.

From the time of seeding till the first picking is ready will be about 120 days. The number of days between the different pickings varies considerably, depending largely on the amount of sunshine and heat. They may vary anywhere from about fifteen to forty days. In this country, where we have a high percentage of sunshine, the variation in the number of days between each picking should be considerably lessened, and the period between the pickings should be a bit shorter, particularly with early maturing varieties.

Besides yield, quality is another important factor to be considered in determining the best variety to plant. For example, a variety might give the highest yield of cotton and yet the length of the staple be short, while on the other hand the length might be satisfactory, but still the fibre may be so coarse and rough as to greatly reduce its value. A short staple would be one measuring, say, less than an inch, while those measuring an inch or more may be classed as long staples.

Quality combines length, silkiness, strength, cleanliness, and colour of staple. Then to have an ideal variety it would be one giving high yield and at the same time being of good quality. We wish to point out in this connection that these two conditions do not tend to go together; high yields of seed cotton are frequently associated with staple that has a tendency to be short, and long staples are frequently associated with light yields. The fine staples are those which are very soft, velvet-like to the touch, and have a bright silvery lustre.

Cotton is frequently damaged by being stained with insects, such as the stainer (*Dysdercus suturellus*), by having rain on it while it is still in the field, and by broken particles of the leaves and burrs being mixed with the cotton, caused by careless picking.

From the above explanations one will see that an earnest study is necessary to determine the most suitable variety to grow in any particular district.

HOW TO INCREASE THE YIELD.

In discussing this topic, the question of "extensive cultivation *versus* intensive cultivation" is a most important one and one to

which we have devoted but little thought. In new countries where vast stretches of land are available for cultivation it appears to be the prevailing rule to plant large areas with the idea of producing a crop with just as little cultivation as possible. This is a serious mistake, for it exhausts the fertility of the soil wihout producing a return which justifies it. Is it not far better to have 100 acres of cotton under proper cultivation, producing 800 lb. of seed cotton per acre, than to have 200 acres of poorly cultivated cotton and producing only 400 lb. of seed cotton per acre? In the first instance, intensive cultivation would be required, whereas, in the second instance, it would be the result of extensive cultivation. But think of the labour saved in the original preparation and subsequent cultivation of 100 acres of land compared to that required for 200 acres. Then consider the time saved in the several pickings with only half as much acreage to cover.

There is every argument in favour of intensive cultivation and not a single one in favour of extensive cultivation, if, to accomplish the latter, the crop is allowed to suffer owing to lack of proper attention.

Some may ask, "What is meant by intensive cultivation?" It means to put the land in fine tilth before sowing the seed; to sow good seed thereby securing a good stand; to cultivate the crop once every week or ten days until the plant begins to form squares for the blooms; to stir the surface soil just as soon after every rain as the soil is in workable condition; this is done to destroy the capillary tubes which are formed in the soil by the percolation of the water during the rainfall, and thus preventing—in a large measure—the heavy loss by capillary attraction of the soil moisture which is so essential to the growing plants. Keep the crop clean of weeds and grass, as these rob the growing plants of the available plant food and moisture in the soil. In short—secure a maximum yield of cotton at a minimum cost. (See Plates Nos. 7 and 8.)

Creating New Varieties by Hybridization.

This is a line of investigation which may not appeal to the average farmer unless he be of an inquisitive nature or ambitious to discover something new. The farmer who is not accurate and painstaking in keeping records had better not attempt hybridizing, because it is necessary to keep the seeds produced as the result of cross-breeding separate from the rest of his crop. There is so much uncertainty as to the characteristics which the hybrid will develop that it is not safe to allow it to mingle with the general crop. Generally speaking, hybrids take an intermediate form between the two parent plants, and sometimes, instead of combining their good qualities, some of the poorer ones will predominate, producing an unsatisfactory result in the hybrid. Then, again, a cross may be made in which the bond is weak and the following year there will be a split or breaking down of the bond resulting in a complete reversion to the two original parent types. In that event a field of cotton grown from such seed would be mixed, thus producing two or more types instead of one, which would be very undesirable.

Cultivation.

The seed should be sown in rows 3½ to 4 feet apart when dealing with upland or annual varieties, and at the rate of about 10 or

15 lb. to the acre. It is well to sow rather thickly and when the plants are strong enough to withstand the insects and weather; then thin or "chop out" with a hoe, leaving one plant every 18 to 24 inches apart, depending on the fertility of the soil. The more fertile the soil the more room will be required for each plant to develop a good yield of lint.

Caravonica, or tree varieties, should be planted in hills about 9 feet apart each way.

The seeds of annuals are planted in drills with a cotton seed planter or planted by hand, and are covered to a depth of 2 or 3 inches. If the soil is dry and hot the seed will require the greater depth. As soon as the plants are up well, surface cultivation should be commenced, and it should be continued till the squares for the blooms begin to form (see Plate No. 5); then cultivation should cease

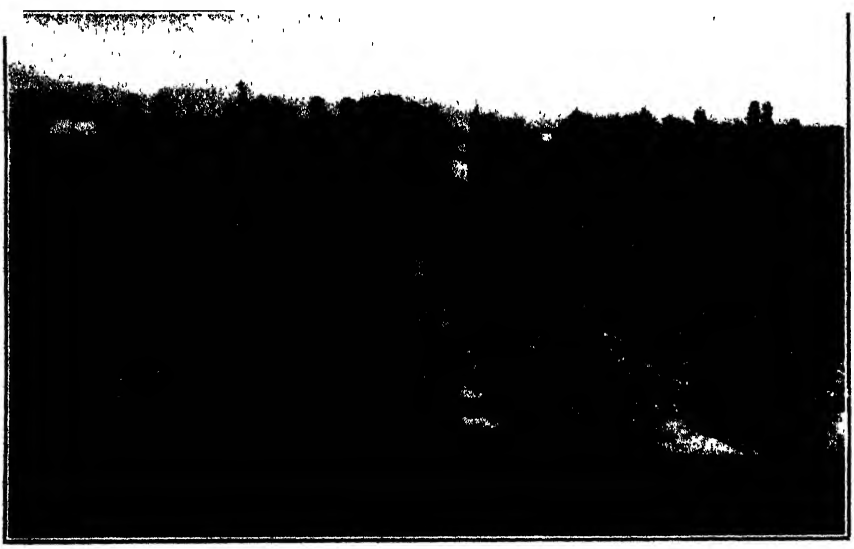


Plate No. 5.] [*Photo by H. W. T.*

Field of Cotton ready to discontinue Cultivation. Rustenburg Experiment Station.

as there is danger of damaging the plants, thus causing them to produce poor lint. The amount of hand scoffling necessary to keep the weeds and grass down in the drills will depend on the extent to which the land is infested; usually, going over once while the plants are small is sufficient.

Some of the implements ordinarily used in proper cotton cultivation are: breaking plough, diamond harrow, disk harrow, "middle splitter". half shovel, small sweep, half shovel with fender, solid sweep, double row cultivator, one-horse harrow, hoe, planter, and fertilizer distributor; however, a small trial crop can be cultivated with the same implements used for mealie cultivation. (See Plates Nos. 1 and 2.)

The soil should be stirred frequently, say, once every ten days, during the early growth and especially after rain. The crust should be broken to destroy capillary attraction and thus prevent excessive evaporation of the soil moisture, as previously explained.

CROP ROTATION.

Diversified farming, with a system of crop rotation, has never been taken seriously by the average South African farmer, for the reason that there has always been an abundance of virgin soil to move on to just so soon as the cultivated lands begin to show that they are becoming exhausted of their fertility. This condition of affairs is being gradually done away with. The day is not far distant when the farmer will find it necessary to cultivate the same land year after year. In some of the older and more thickly settled parts of the country such is already the case. These farmers are beginning to realize that something must be done to maintain the fertility of their soils, else the yield will soon fall below the cost of production. To the man who proposes to grow cotton we should like to point out that if the cotton seed and stalks were all returned to the soil, theoretically, cotton could be grown on the same land year after year for an indefinite period; as the fibre is practically a pure hydro-carbon—these elements, hydrogen and carbon, are supplied by the air. But cotton, like other crops, should be grown in rotation with other crops, because in practice we do not return the seed and stalks to the land. Again, if the same crop is grown on the same soil year after year the insects, bacteria, and parasites which prey on that crop are also given an opportunity to greatly increase in numbers, and thus become a serious menace. It is a recognized fact that one of the best methods of combating these enemies is a rotation of crops. For example, rooibloem or witchweed, when once established in a mealie field, becomes very destructive where mealies follow mealies year after year; but rooibloem is not parasitic to cotton or tobacco, and consequently can be eradicated by a change to some such crop.

The crops suitable to fit into a rotation scheme are numerous, and those selected must depend largely on local conditions. The number of years used in the rotation scheme must depend largely on the kind of crops planted. We are experimenting with a four years' rotation in connection with fertilizer experiments. The results thus far obtained and the kind of fertilizers used will be given under the sub-head fertilizers. The crops used in the rotation are as follows:—

First year, cotton.
Second year, a legume (lucerne, velvet beans, cow-peas, soya beans, or monkey nuts).
Third year, mealies (and a winter crop of cereals).
Fourth year, tobacco.
Fifth year, back to cotton again; and so on.

If lucerne is used in the rotation and a good stand is secured, it is advisable to let it remain so long as it is profitable, even though it may upset the rotation system that has been adopted. There is no forage crop that is superior to lucerne for grazing, for hay, or to restore fertility to the soil.

If a farmer possesses a small acreage and cannot arrange a four years' rotation, he might adopt a two years' system, thus:—

First year, cotton.
Second year, tobacco or mealies (and a winter crop of bur closer, hairy vetch, or lupins).
Third year, back to cotton again; and so on

Stock farming, with all of its diversifications, offers a splendid line for profit, and one which aids materially in keeping up soil fertility. It can also be worked into a rotation system.

The more manure there is produced and distributed on the lands, within practical limits, the greater will be the producing power of the soil.

It is not so important to follow a rotation system if the soil is supplied with an abundance of barnyard manure; but where the supply is limited, as is usually the case, it is very important that a rotation system be adopted which will give to the soil an occasional green manure crop.

MAINTAINING THE FERTILITY OF THE SOIL.

The most successful farmer is the one who practices an intelligent system of green manuring and crop rotation. It pays not only in an immediate pecuniary way, but it eventually reacts beneficially to the owner by the value of the land being increased if a high state of fertility is maintained. Previously, crop rotation has been suggested with a view to pointing out the profits to be realized on the crops themselves; and the advantage of a rotation system for the purpose of combating insect pests, fungus, and other diseases. We now wish to call your attention to the advantages of a rotation of crops for the purpose of maintaining the fertility of the soil. We must first realize that by taking out the plant food naturally contained in soils without replacing it in some manner and not exhaust their fertility, is quite as impossible as it would be for one to continue drawing on his banking account without making any deposits and not exhaust one's credit. The quantity of plant food in soil is just as definite as the amount of one's bank deposit.

It is known that plants use oxygen, hydrogen, nitrogen, carbon, silicon, calcium, iron, magnesium, sulphur, phosphorus, sodium, potassium, and possibly a few other elements which have not been mentioned. Most of these elements are usually supplied in sufficient quantities for the growing crops either by the atmosphere or by the soil. There are, however, exceptions. Frequently potassium, phosphorus, nitrogen, and sometimes calcium, must be supplied on constantly cultivated lands, by artificial means, or the result will be that the soil will become "tired" or worn out. This can in a large measure be obviated by rotating crops and using a deep-rooted crop in the rotation.

In this way plant food deposited deep down in the sub-soil is brought up and deposited in the roots of the plants near the surface, where, after they decay, it becomes available for the next crop. Again, it is important to use one of the leguminous crops, such as lucerne, clover, velvet beans, soy beans, cow-peas, monkey nuts, or any of the leguminosae group in the rotation, as these plants have the power of extracting nitrogen from the air through the medium of millions of nitrifying bacteria which form in colonies on the roots of the plants. The nitrogen is deposited in little nodules on the roots of these leguminous plants, and is left in an available form for the crop which is to follow.

Nitrogen is the most expensive one of the fertilizing elements, the average cost being probably 1s. per lb., while the other fertilizing

elements should not cost half that amount. Then the importance of supplying the nitrogen through the medium of the legumes will therefore be readily understood.

DIAGRAM OF FERTILIZER PLOTS.

FERTILIZERS APPLIED.

Plot No.					Plot No.
1	Lime, 250 lb.	(Check	Plot.)	No lime.	1
2	Lime, 250 lb	Sulphate of potash, 100 lb.	Sulphate of potash, 100 lb.	No lime.	2
3	Lime, 250 lb	Nitrate of soda, 80 lb. Dried blood, 100 lb.	Nitrate of soda, 80 lb. Dried blood, 100 lb.	No lime.	3
4	Lime, 250 lb.	Acid phosphate (37 p.c.), 160 lb.	Acid phosphate (37 p.c.), 160 lb.	No lime.	4
5	Lime, 250 lb.	(Check	Plot.)	No lime.	5
6	Lime, 250 lb.	Nitrate of soda, 80 lb. Dried blood, 100 lb. Sulphate of potash, 100 lb.	Nitrate of soda, 80 lb. Dried blood, 100 lb. Sulphate of potash, 100 lb.	No lime.	6
7	Lime, 250 lb.	Sulphate of potash, 100 lb. Acid phosphate (37 p.c.), 160 lb.	Sulphate of potash, 100 lb. Acid phosphate (37 p.c.), 160 lb.	No lime	7
8	Lime, 250 lb.	Nitrate of soda, 80 lb. Dried blood, 100 lb. Acid phosphate (37 p.c.), 160 lb.	Nitrate of soda, 80 lb. Dried blood, 100 lb. Acid phosphate (37 p.c.), 160 lb.	No lime.	8
9	Lime, 250 lb	Nitrate of soda, 80 lb. Dried blood, 100 lb. Sulphate of potash, 100 lb. Acid phosphate (37 p.c.), 160 lb.	Nitrate of soda, 80 lb. Dried blood, 100 lb. Sulphate of potash, 100 lb. Acid phosphate (37 p.c.), 160 lb	No lime.	9
10	Lime, 250 lb.	Kraal manure, 10,000 lb.	Kraal manure, 10,000 lb.	No lime.	10
11	Lime, 500 lb.		Lime, 500 lb		11
12	Lime, 250 lb.	(Check	Plot.)	No lime.	12

Still another important factor found in the composition of soils, and one which is absolutely necessary to render a soil productive, is humus or decaying vegetable matter. A soil void of humus will not produce a crop—it matters not how much artificial fertilizer is applied to it—because, in the first place, humus acts like a sponge in the retention of soil moisture (without it the soil would be as dry and

lifeless as a brick), and secondly, without humus and moisture the active soil bacteria could not exist. Then, again, humus renders the soil loose and friable. Having no humus in the soil the atmosphere would fail to penetrate it, and the result that although plant food may be stored in the soil it would not be in an available form. We are aware that when the soil becomes infused by the air chemical action takes place, carbonic acid water is formed, and this in turn acts on the insoluble parts of the soil, liberating plant food which would otherwise remain for ever stored up in a non-available form.

FERTILIZERS.

Where soils have been largely exhausted of their fertility it may be found necessary to apply, as a temporary expediency, artificial fertilizers; though I would not advise farmers to make it a custom of using artificial fertilizers, particularly for the purpose of supplying nitrogen. If there is a shortage in potash or phosphoric acid to begin with, or when a shortage is caused from over-cropping, which will ultimately come if there is no rotation of crops, then these elements must be supplied. If a soil has been so exhausted of its fertility as to require the addition of artificial fertilizers in order to maintain its producing power, a field test should be made by the farmer to determine just what element or elements of plant food are needed. For example, he might find that phosphoric acid would increase the yield of his crop as much as a complete fertilizer; in this event it would be a waste of money to buy potash or nitrogen. It is a known fact that the soils in the different districts, and sometimes even on the same farm, possess varying quantities of nitrogen, potash, and phosphoric acid. It is therefore essential that every farmer should know something of the composition and need of his soil, and the requirements of the crops he cultivates, in order that he may purchase artificial fertilizers possessing only the element or elements needed. For instance, a soil in one district may contain a liberal supply of potash, but be deficient in phosphoric acid; and in another district the conditions might be just the reverse. Not having reference to a special soil in any district, we would point out, that where artificial plant food is required, a high grade fertilizer is more economical to buy than a low grade one. It would be more profitable, for example, to pay £12 per ton for a fertilizer carrying 4 per cent. of nitrogen, 6 per cent. of potash, and 16 per cent. of phosphoric acid, than to pay the same amount for double the quantity of fertilizer carrying 2 per cent. of nitrogen, 3 per cent. of potash, and 8 per cent. of phosphoric acid. There would be a saving of half of the cost of freight, transport, bags, and handling, and at the same time the crop would require just half the amount of the high grade fertilizer. Therefore, the one ton would serve for the same acreage as would two tons of the low grade fertilizer. Just in this connection, we wish to make the suggestion that when farmers purchase fertilizers in future they do not buy them on account of some fancy trade name under which they may be advertised, such as "cotton special" or "high grade tobacco fertilizer", but that they will completely disregard the names and buy as much potash, phosphoric acid, or nitrogen as they need, keeping in mind the requirements of their soil and the crop which they propose to grow. Fertilizers in many instances can be used profitably provided they are purchased and applied intelligently.

The method commonly practiced for distributing fertilizers is to

open a furrow, sow the fertilizer in the furrow at the rate of about 200 lb. per acre, run a "scooter" (single shovel) in the furrow, and mix the fertilizer with the soil. A better way to do it would be to cover slightly, about 2 inches, and then sow the cotton seeds over the fertilizer. By this process, the seeds will not be in immediate contact with it.

The most rapid method of distributing the fertilizer is to have a fertilizer attachment to the planter. It opens the furrow, sows the fertilizer, and seeds and covers them, all in one operation.

The question of broadcasting fertilizers for various crops has not been worked up as thoroughly as hill and drill fertilizing, though for permanent improvement of the soil broadcasting should prove to be the better plan. In our fertilizer and rotation experiments you will note by referring to the rotation scheme that the fertilizer is applied once every four years and only to the tobacco crop; we broadcasted the fertilizer and then worked it into the soil before planting the tobacco. The attached diagram shows the kind and quantity of fertilizer applied to each plot. The twelve plots contain one-half acre each, and they are sub-divided into quarter acre plots so that, in each case, one quarter acre has lime in connection with the fertilizer and the other quarter acre, in each case, has fertilizer only.

TABLE No. 2.

Plot No.	Place.	No. lb. Seed Cotton per plot.	No. lb. Seed Cotton per acre.	No. lb. Lin. per acre.	No. lb. Seed per acre.	Loss in Weight from Ginning.	Percentage of Lint.	Value of Lint per acre at 5d. per lb.			Value of Seed per acre at 5s. per 100 lb.			Total (estimated value of crop per acre.		
								£	s.	d.	£	s.	d.	£	s.	d.
1 Limed......	Rustenburg	149·5	598	180	404	14	30	3	15	0	1	0	2	4	15	2
1 Unlimed....	,,	60·5	242	72	168	2	29·7	1	10	0	0	8	5	1	18	5
2 Limed......	,,	182	728	226	488	14	31	4	14	2	1	4	5	5	18	7
2 Unlimed....	,,	62	248	76	172	0	30·6	1	11	8	0	8	7	2	0	3
3 Limed......	,,	169	678	208	440	30	30·7	4	6	8	1	2	0	5	8	8
3 Unlimed....	,,	64	256	80	168	8	31·2	1	13	4	0	8	5	2	1	9
4 Limed......	,,	218·5	874	248	572	52	28·3	5	3	4	1	8	7	6	11	11
4 Unlimed....	,,	108	432	112	296	24	25·9	2	6	8	0	14	10	3	1	6
5 Limed......	,,	223·5	894	280	636	+	31·2	5	16	8	1	11	10	7	8	6
5 Unlimed....	,,	84	336	88	180	68	26·2	1	16	8	0	9	0	2	5	8
6 Limed......	,,	215	860	268	590	2	31·1	5	11	8	1	9	6	7	1	2
6 Unlimed....	,,	105	420	128	284	8	30·5	2	13	4	0	14	2	3	7	6
7 Limed......	,,	365	1460	460	992	8	31·5	9	11	8	2	9	7	12	1	3
7 Unlimed....	,,	159·5	638	204	432	2	32	4	5	0	1	1	7	5	6	7
8 Limed......	,,	301	1204	408	784	12	33·9	8	10	0	1	19	2	10	9	2
8 Unlimed....	,,	176	704	216	448	38	30·7	4	10	0	1	2	5	5	12	5
9 Limed.....	,,	429·5	1718	556	1156	6	32·3	11	11	8	2	17	10	14	9	6
9 Unlimed....	,,	226·5	906	284	604	18	31·3	5	18	4	1	10	2	7	8	6
10 Limed......	,,	387·5	1550	488	1052	10	31·5	10	3	4	2	12	7	12	15	11
10 Unlimed....	,,	199·5	708	252	528	18	31·5	5	5	0	1	6	5	6	11	5
11 Limed......	,,	224	448	144	308	+	32·1	3	0	0	0	15	4	3	15	4
12 Limed......	,,	146	584	164	408	12	28·1	3	8	4	1	0	4	4	8	8
12 Unlimed....	,,	35·5	142	32	96	14	22·5	0	13	4	0	4	10	0	18	2

By referring to Table No. 2 you will observe that in nearly every instance lime in connection with the fertilizers gave a decided increase in crop over the unlimed portions. The best yield was obtained from Plot No. 9, limed portion, which gave 1718 lb. seed cotton per acre, Plot No. 10, limed portion, gave second best results, showing 1550 lb. seed cotton per acre. Plot No. 7, limed portion, came third with 1460 lb. seed cotton per acre, and Plot No. 8, limed portion, came

Plate No. 6.] *[Photo by H. W. T.*

Field of Cotton showing a few burrs open but not ready to begin picking. Rustenburg Experiment Station.

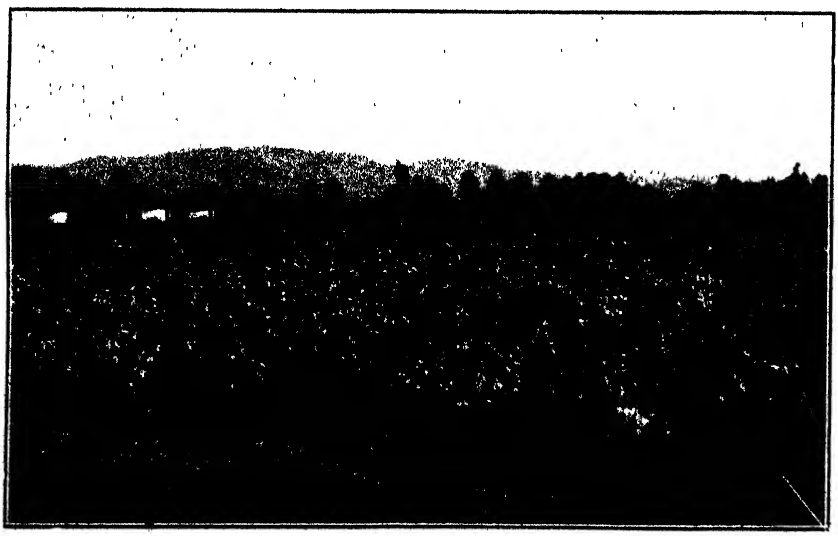


Plate No, 7.] *[Photo by H. W. T.*

Field of Cotton ready for Harvesting. Rustenburg Experiment Station.

fourth with 1204 lb. seed cotton per acre. By referring in the last column to the estimated values of the crops from these plots, and compare them with the values of some of the lighter yielding plots, one will see the difference between a paying and loosing proposition.

This being only the second year that this fertilizer and rotation experiment has been conducted we should not take the results shown in Table No. 2 as final, although the same fertilizer plots which gave the best results in cotton also gave good results in tobacco the previous season, especially those containing phosphates in the formular. The same can be said of the winter forage crop.

HARVESTING.

South African farmers are especially blessed with a clear autumn and winter to harvest their crops. The first picking of cotton should be commenced when the plants are fairly white with open bolls, but

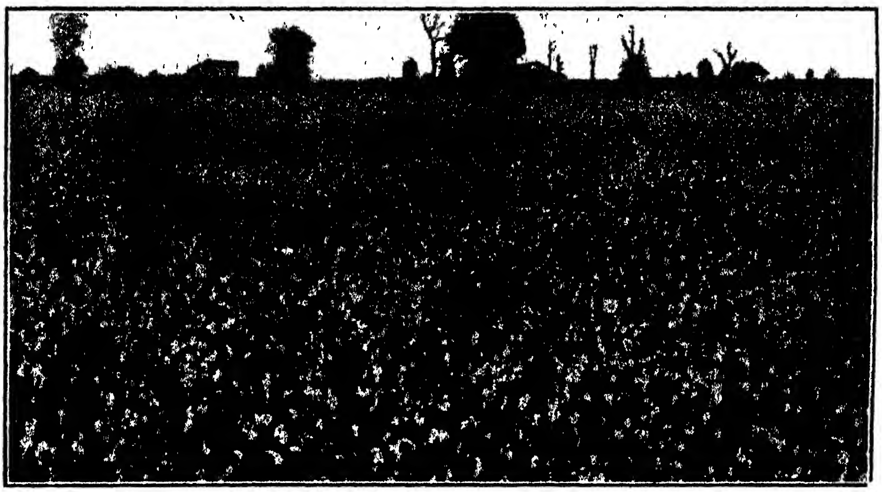


Plate No. 8.] *[Photo by Christopher Eng. Co., Richmond, Va.*

Broad acres of snowy whiteness, showing "The Quarters," Mississippi Valley.

before the cotton begins to fall out of the burrs and waste (see Plates Nos. 6 and 7); likewise the second, third, and fourth pickings. After the lands have been gone over three or four times practically all of the cotton will have been picked and housed. Then the old stalks should be cut, piled, and burned; by so doing a large number of insects are destroyed.

It has been demonstrated in other countries that cotton is a splendid crop for utilizing native labour, and that the natives readily adapt themselves to cotton production. Harvesting is the period which requires the greatest amount of labour, but fortunately the women and children are found to be very useful in this connection. Each native is supplied with a large hamper basket or burlap sack, which he carries along between the rows to put the cotton in as he picks it. At each end of the row a large receptacle or bucksail is placed for them to pour the cotton in from time to time. In America the natives are paid from 15d. to 25d. per 100 lb. The average

amount picked by an adult is about 125 lb. per day, though the fastest pickers in good fields (see Plate No. 8) average 200 lb. to 250 lb. This method of employment appears to be better than the one at present adopted in some parts of South Africa, where the farmers pay approximately one shilling per day, and the average hand picks about 50 lb.

If there is a heavy dew or rain, picking should be postponed for a while, but just as soon as the sun shines to dry the cotton the picking may be continued.

When the cotton is picked during very dry weather it is ready for ginning almost immediately, though usually the farmer stores it in a large store room till the entire crop has been housed.

Plate No. 9.] *[Photo by O. B. C.*

Gins in operation—separating the Lint from the Seed. Tzaneen Estate.

Marketing.

The seed cotton is delivered at the gin loose, in a large wagon bed. The small farmer should not attempt to own his own gin, as the cost of fitting up a ginning plant would be too great. But a community of farmers will find it profitable to co-operate in operating a central gin. A few gins, established in a community will be sufficient to do all of the ginning for the entire district. If a community of farmers used their own labour and had an economical plant they should gin their cotton at a cost of about ½d. per lb. of lint.

The Government has found it desirable, in the initial stage of the cotton industry, to establish and operate gins at the Tzaneen Estate (see Plate No. 9) and Rustenburg Cotton Station to gin cotton for farmers. A charge is made to cover cost of material and labour. Other persons operating gins in the country are S. A. Nathanson Commandite, Durban, Capt. Elphick, Malelane, Transvaal, and the Chamber of Commerce, East London.

After the crop is disposed of, the farmer should make some simple calculations and see what it has cost him to grow and market his

cotton, and thus see for himself whether the crop is a profitable one. He should compare the net profits with those from other crops and see which pays best. Too many farmers go on from year to year, producing certain crops, frequently at an actual loss, but they are not aware of the fact that they are losing money on that particular crop. By making calculations and comparisons, as indicated above, he will be in a position to discard those crops which are not paying and go in only for the profitable ones.

COST OF PRODUCTION AND NET PROFITS.

Heretofore we have calculated the cost of producing one acre of cotton at £1. 17s., basing our calculations on American conditions, where cotton production is well organized. But in this country the cost will probably run a little higher. Below is given the approximate cost of producing one acre; this multiplied by the number of acres planted would give the approximate cost of producing a crop of cotton:—

Preparing and breaking (old lands)	£0	10	0
Harrowing	0	2	0
Planting	0	1	0
Cultivating	0	5	0
Harrowing and hand hoeing	0	7	0
Picking 1000 lb.	0	15	0
Cartage to gin	0	1	0
Wear and tear on implements	0	1	0
Sundries	0	3	0
	£2	5	0

One acre of good cotton should produce 1000 lb. of seed cotton giving 30 per cent. of lint, i.e.

300 lb. at 5¾d. per lb.	£7	3	9
Total cost of production	2	5	0
Profit per acre	£4	18	9

The last two or three crops marketed have realized on an average more than 5¾d. per lb. American uplands have at times fetched on the European market about 7d. per lb. Reports on South African cotton usually place it about 1d. per lb. higher than American uplands. But, placing our cotton at 7d. per lb., the price we received last year, with the above calculations, we have:—

300 lb. lint at 7d. per lb.	£8	15	0
Cost of production	2	5	0
Showing a net profit per acre of	£6	10	0

We have indicated elsewhere that in our fertilizer plots last season the highest yield per acre was 1718 lb. seed cotton, with 32.3 per cent. of lint; estimating the value of the lint alone at 5¾d. per lb., the average price for American upland cotton for the past five years, and increasing the cost of production 5s. to cover the increased cost of picking a heavy yield, we have:—

554 lb. lint at 5¾d. per lb.	£13	6	5
Cost of production	2	10	0
Showing a net profit per acre of	£10	16	5

and in our variety tests Russells Big Boll gave 1684 lb. seed cotton per acre, with 32.3 per cent. lint; placing the same value on the lint, we have:—

544 lb. lint at 5¾d. per lb.	£13	0	8
Cost of production	2	10	0
Showing a net profit per acre of	£10	10	8

While we have no guarantee that this high price will be maintained, it is safe to predict that a commodity like cotton, which is one of the necessities of life, will, under normal conditions, always command a fair price. It is noteworthy that the American crop just housed is estimated by the Bureau of Statistics, United States Department of Agriculture, to be the largest yet produced, amounting to something like 14,885,000 bales of lint of approximately 500 lb. each. Whereas the largest previous crop produced in the States was, in 1904, 13,700,000 bales. If the present American crop sells for 5¾d. per lb., the average price obtained by them for the last five years, they will receive the stupendous sum of, approximately, $868,369,193 (£178,309,896). The southern planters, having this condition before them and the memory of past experiences, they are taking steps to organize themselves into co-operative unions to deal with their cotton, and they have proposed 7½d. per lb. as a standard of value on their lint.

It would appear that, with this enormous yield, there would not be much room for South Africa to enter into competition, but when I point out to you that twice the above amount could be used, and that if the millions of people going about the earth naked were clothed, it would require three or four times the amount now produced.

In Great Britain there are working annually more than fifty million spindles, representing invested capital to the amount of about eighty millions sterling. These facts alone should be sufficient to convince even the most pessimistic that there is an enormous demand for cotton, and that it is a safe and profitable crop to cultivate.

Is it not time that South Africa, with her many natural advantages, should step forward and participate in the production and profit earning of this important crop?

ACKNOWLEDGMENTS.

United States Department of Agriculture's Bulletin No. 33, "The Cotton Plant", was referred to to obtain the historical facts.

The officers in charge of the Experiment Stations at Tzaneen, Rustenburg, Barberton, and Piet Retief conducted the field experiments reported in this bulletin.

Plate No. 8 is a reprint by courtesy of *The Cotton Seed Oil Magazine,* Atlanta, Ga., United States of America.

Experiments with Ostriches—XX.

THE ANATOMY AND PHYSIOLOGY OF THE OSTRICH.

C.—THE INTERNAL ORGANS (*Continued*).

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Rhodes University College, Grahamstown.

(*Continued from page* 507.)

2. The Respiratory System.

The *respiratory system* (Fig. 3) provides for the taking into the body of pure air through the trachea or air-tube, the exposing of it over a finely divided system of air-tubes and air-sacs to the blood circulating within the lungs, so that an exchange of gases can take place, and then its expulsion again from the body. In birds, as compared with mammals, the system is rendered more complex by the addition of large membranous air-sacs, which are really continuations of the main divisions of the air-tubes in the lungs, and allow for a larger amount of air to pass through the lungs.

The rapid rising and falling of the side walls of the front part of the body, bringing about inspiration and expiration, can be easily observed in ostriches on very warm days, when they stand gasping with their wings and feathers outstretched.

Before hatching takes place, the chick does not breathe by means of its air-tubes and lungs, but by a thin membrane, known as the allantois, which grows out from the body of the chick. This is richly supplied with blood and spreads over the inside of the shell, and air is able to pass in and out to the blood through the pores of the shell. On breaking into the air-chamber, just before hatching, the chick for the first time uses its lungs and begins to chirp within the unbroken shell. The air-chamber of the egg is formed by the slow accumulation of air between the two shell membranes.

The Trachea or Windpipe.

The *trachea* commences behind the tongue at the back of the mouth with a wide circular aperture, the glottis, about an inch in diameter, which becomes slit-like when closed by the approximation of the two sides. Its topmost part forms the larynx or voice-box in mammals, but this is quite rudimentary in all birds and incapable of producing any sound whatever, the functional vocal chords in birds being in the syrinx or lower larynx at the lower extremity of the windpipe. In the ostrich, however, the syrinx or voice-box is remarkably simple compared with the complex mechanism of singing birds. It is devoid of muscles and vocal chords, having only a vibrating membrane on the last tracheal ring. This simplicity is what would be expected considering the well-known limited powers of producing

sound in the ostrich. These are restricted to the feeble chirping of chicks, the bromming and groaning of the cock, and the hissing of both cocks and hens when greatly excited over their chicks or fighting among themselves.

The windpipe passes straight down the middle ventral line of the neck, with the foodpipe dorsal to it and then on its right side (Fig. 3). It consists of about two hundred thin narrow bony rings, which serve to keep it permanently open for the passage of the air downwards and upwards. In section the tube is oval, a little flatter on its inner than on its outer surface. The longer diameter is one and a quarter inches, and the shorter three-quarters of an inch. Each bony ring is made up of two parts, a larger forming the front and sides and a smaller at the back closely joining the two ends of the former. By this means a certain elasticity is given to each ring. In chicks the rings are cartilaginous, becoming bony later.

Towards the lower end of the trachea two well-developed muscles, the sterno-tracheal muscles, are given off, one on each side, and connect the trachea with the sternum.

On entering the body the trachea divides into two short bronchi, right and left, which pass to the corresponding lung. The bony rings strengthening their walls are incomplete, and on the inner face of each bronchus is the internal tympanic membrane, which assists in the intensification of sound. If a bronchial tube be slit open and followed into the substance of the lung, it is found that the bony rings extend only a short distance, and the tube (merobronchium) enlarges into a small sac-like space, the vestibule, which opens by a large aperture at the side of the lung and communciates with the most posterior of the air-sacs (Fig. 3).

On the inner face of the vestibule are seen four openings. The first three on being slit open are found to lead into secondary bronchial tubes (entobronchia) which open at the surface of the lung as shown in Fig. 3, and communicate with air-sacs; the fourth opening leads into a short tube which divides and loses itself in the substance of the lung. On the outer dorsal wall of the vestibule are four or five other openings which lead into further secondary bronchial tubes (ectobronchia) and supply air mainly to the dorsal part of the lung, but do not open to the surface.

The Lungs.

The *lungs* are comparatively small in size and are situated dorsally under the heart and liver, partly obscured by the partitions of the air-sacs and other membranes. They are a bright salmon-pink in colour, flat on their ventral surface, while on their upper surface they fit into the spaces between the six large ribs (2-7) and also lie against the backbone. They extend from the front of the body-cavity as far as the upper end of the kidney. On the surface are seen five openings by means of which the bronchial tubes communicate with the five air-sacs (Fig. 3). The lower surface is closely invested by a thin fibrous membrane, the pulmonary aponeurosis, into which are inserted a number of muscular bands, costo-pulmonary bands, running to the vertebral ribs.

The lungs of birds are richly supplied with blood and are spongy in texture, but capable of very little distention. The air taken in fails to expand them, but passes through on its way in and out of the air-sacs, aerating the blood during its passage.

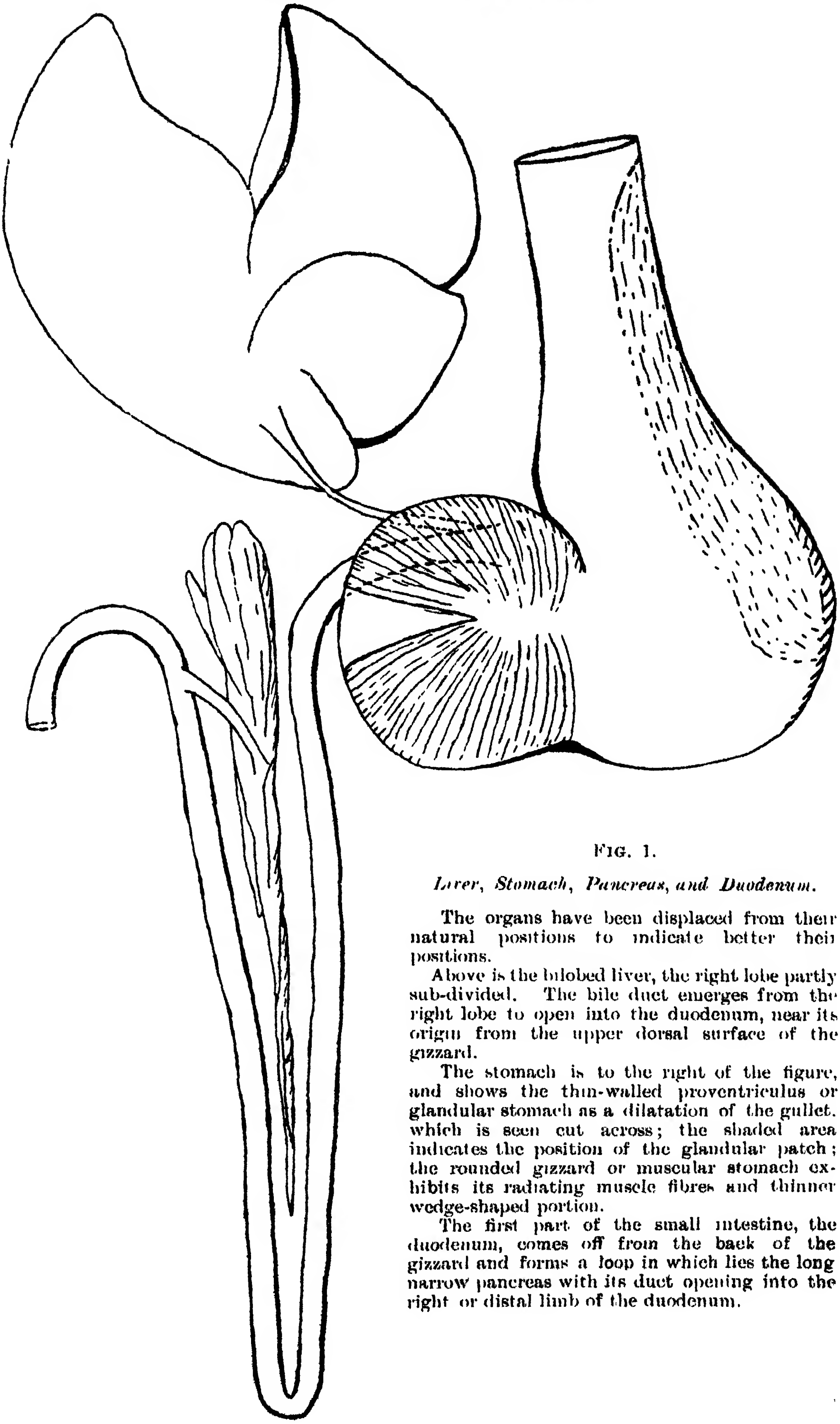

FIG. 1.

Liver, Stomach, Pancreas, and Duodenum.

The organs have been displaced from their natural positions to indicate better their positions.

Above is the bilobed liver, the right lobe partly sub-divided. The bile duct emerges from the right lobe to open into the duodenum, near its origin from the upper dorsal surface of the gizzard.

The stomach is to the right of the figure, and shows the thin-walled proventriculus or glandular stomach as a dilatation of the gullet. which is seen cut across; the shaded area indicates the position of the glandular patch; the rounded gizzard or muscular stomach exhibits its radiating muscle fibres and thinner wedge-shaped portion.

The first part of the small intestine, the duodenum, comes off from the back of the gizzard and forms a loop in which lies the long narrow pancreas with its duct opening into the right or distal limb of the duodenum.

The Air-Sacs.

Air-sacs are present in all birds. They are thin membranous extensions of the air-tubes of the lungs, and openings from the bronchial tubes at the surface of the lungs communicate with each. In the ostrich five air-sacs are present on each side, much smaller relatively than in most flying birds. They are situated ventral to the lungs and extend a short distance into the neck and also along each side of the body, between the body-wall and the viscera. They are best seen when searching for the lungs by pushing aside the liver.

From before backwards the air-sacs are named as follows: the pre-bronchial (cervical), the sub-bronchial (interclavicular), the anterior intermediate, the posterior intermediate, and the abdominal. The most anterior pair are situated around the base of the neck on each side, and the two next form a single median sac, its wall easily seen between the body and the neck on skinning a bird; the three next come out very clearly after cutting away the sternum, situated between the liver and body-wall; the abdominal is the largest of the series and extends some distance over the kidneys.

The air-sacs are continued into most of the principal bones of the skeleton, such as the humerus, sternum, coracoid, and the vertebrae, entering through holes in the bones and giving to the latter the pneumaticity characteristic of the bones of birds. They may also pass in between the muscles.

Air-sacs are an integral part of the respiratory apparatus of birds. By their means a greater amount of air can pass in and out over the lungs during inspiration and expiration, and consequently there is less need for the expansion of the lungs themselves. Their prolongations towards the outer surface of the body probably assist in regulating the moisture and heat of the body. They also give lightness to the bones they enter.

3. THE EXCRETORY SYSTEM.

The physiological activities going on within the ostrich result in the partial breaking down of the the tissues and the production of waste gases, liquids, and solids, which pass into the blood. The waste gases are removed mainly by the lungs and the liquids mainly by the kidneys, including also the surplus water. The matters excreted by the kidneys pass down the ureters into the cloaca, where. as liquid or semisolid urine, they are discharged from the body, generally followed by the expulsion of the fæces or undigested food from the alimentary canal.

The Kidneys.

The *kidneys* (Fig. 4) are large, elongated, trilobed, flattened bodies, very different in appearance from the compact oval kidneys in such an animal as the sheep. They are chocolate brown in colour, coarsely granular in structure, and lie close against the back part of the body, embedded in the recesses of the pelvic region, and meeting one another in the middle line under the vertebral column. The left kidney is slightly lower than the right, the latter stretching from the lower end of the lung nearly to the cloaca.

Each kidney is made up of three lobes. The first is flat and nearly circular, and is connected with the middle lobe by a narrow bridge. The third lobe is the largest, and from its lower end the short ureter emerges, conveying the urine to the middle chamber of

the cloaca. On their ventral surfaces the kidneys are covered by a bright, glistening, peritoneal membrane, so that they appear as if shut out of the body-cavity. This membrane must be stripped off if it is desired to study the kidneys in detail or to remove them; the

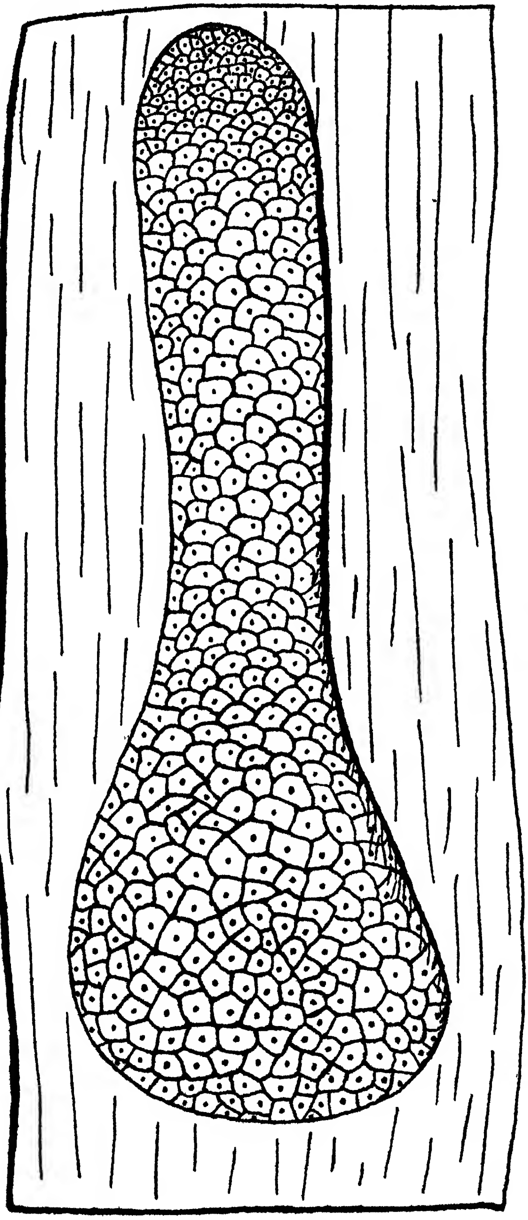

FIG. 2.

Portion of wall of proventriculus or glandular stomach flattened out to show the form of the glandular patch with the gastric glands. It is among these glands that the wire-worm occurs.

latter operation presents some difficulty, as the organs fit closely into the irregularities of the body-wall. Several blood-vessels lie partly buried in the surface of the kidney, and the single oviduct of the hen, or the two *vasa deferentia* of the cock, pass under them on their way to the cloaca.

An *adrenal body*, yellowish in colour and oval in outline, is situated at the upper inner extremity of each kidney (Fig 4).

The *urine*, consisting of the surplus water and various waste products, is secreted continuously by the kidneys and, passing down the ureter into the cloaca, is there stored awaiting discharge. Micturition usually immediately precedes defæcation, but is sometimes independent of the act.

The amount and character of the urine varies greatly at different times, largely dependent upon the quantity of water taken in by the bird, either directly or as part of its food; also the nature of the urine is often an indication of the state of health of the bird. Where plenty of green succulent food and water are available the urine is thin and watery, and large quantities are squirted out; but under conditions of drought it may become scant, dense, and of a chalky whiteness, either granular or ropy. Sometimes it comes out as a nearly dry chalky mass, or produces a form of "stop-sickness". Birds badly infested with wire-worm have a small amount of white, dense, sticky urine. In young birds the excretion is occasionally of a reddish brown colour (haematuria).

When chicks are troubled with eversion of the cloaca the urine dribbles out at short intervals, instead of being squirted, has a very offensive smell, and smears the feathers around the cloacal opening. Birds affected with this trouble have been found to have the kidneys anaemic, in fact, almost colourless in places.

Turpentine has a very stimulating effect on the secretory activity of the kidneys.

4. THE CIRCULATORY SYSTEM AND BLOOD PRESSURE.

The *circulatory system* of the ostrich consists of the heart and blood-vessels. The heart acts as a pump for forcing the blood throughout all parts of the body. Of the blood-vessels the arteries carry blood from the heart to the body, the veins convey blood from the body to the heart, and the capillaries are microscopic vessels connecting the two. The capillary walls are so thin that the liquid part of the blood can pass through and bathe the tissues, and also allow waste products to enter the circulation. The blood has a temperature of about 103° F., and the corpuscles or blood cells are oval and nucleated. The blood circulation in the ostrich differs in no important respect from that in other birds and its details are scarcely of importance to the farmer.

The *heart* is short and conical, lying in the middle of the front part of the body, immediately under the breast-plate. It is contained in a distinct cavity, the pericardium, with thick membranous walls and surrounded on both sides by the right and left lobes of the liver. At its broad end are the large arteries and veins which carry the blood away from and back to the heart. As in all other birds and mammals the heart has four chambers, two thin-walled auricles and two thick-walled ventricles, separated by valves; the right being muscular and the left membranous.

The main artery of the body is the aorta. It starts from the left ventricle and arches over to the right side of the body in contradistinction to the left side in mammals; later it gives off branches which supply pure blood to nearly all parts of the body. At its origin come off two smaller arteries, the innominata, each of which divides into two, one supplying the wing, and the other, the carotid,

passing up the neck to the head. From the right ventricle comes off the two pulmonary arteries, right and left, which carry impure blood to the lungs whence it is returned purified by the pulmonary veins to the left side of the heart. Near the origin of the carotid artery is a small, round, reddish body, the thyroid gland.

The principal *veins* of the body, distinguished by having thiner walls than the arteries, are the inferior *vena cava*, returning blood to the heart from the liver and hinder part of the body, and the two superior *vena cavae* from the head and front part of the body. All these open into the right auricle.

Blood Pressure.

Due to the force exerted upon it by the heart the blood throughout its course in the vessels is under a certain pressure, and the amount of this pressure has much influence upon the nourishment of the various organs. In the ostrich blood-pressure has also a very special interest in connection with the nourishment and growth of feathers, its effects in this direction being probably of greater practical significance than in any other animal. Variations in the blood pressure are concerned with the production of the feather defects known as " bars ".

Feathers are formed from the epidermis or outer skin which has no blood-vessels of its own, any more than the nails and hairs of human beings. These epidermal structures receive their nourishment by diffusion from the blood circulating in the underlying true skin or dermis. In the growing feather the nourishing dermal papilla, as it is termed, takes the form of a long, worm-like body in the middle of the feather, where it constitutes the pith or medulla of the feather. It is easily seen when a green feather is cut across, and can be drawn out as a narrow, tapering, red body from the part of the feather cut off. When green feathers in a high state of nutrition are cut across the blood-carrying pith or medulla in the middle is also cut across, and the blood spurts out due to the pressure behind it; if poorly nourished, however, only a feeble haemorrhage occurs. Also when a partly ripe feather or quill is drawn the dermal papilla is torn across and a small amount of blood escapes, both from the tip of the green quill and from the feather socket.

Although it has not yet been actually demonstrated as a physiological experiment there can be no question that the blood pressure in the ostrich has a daily variation, as in most other birds and mammals. This roughly corresponds with the day and night periods, the pressure being somewhat less at night time and early morning than during the day. As the feather, however, grows continuously, day and night, it will follow that the nourishment carried to the feather at night time is under less pressure than that during the day, and consequently the growth will be less vigorous at night than during the day.

The result of this daily variation in the blood pressure can be actually seen on unopened growing feathers, as a succession of denser day and lighter night wings, and the diminished night growth is nearly always indicated by fainter zones on the fully opened feather. The fainter zones are particularly noticeable on feathers which have been poorly nourished during growth, but almost every plume shows hints of them.

As already described in a former paper (*Cape Agricultural*

Journal) the daily variation of the blood pressure is the primary cause of the production of the defects in ostrich feathers known as "bars", the feather sheath kinking at the region of weaker night growth and thereby preventing the proper formation of the part of the feather beneath.

Prolonged cold damp weather also tends to drive the blood supply from the skin into the deeper parts of the body, and this likewise affects the nutrition of the growing feathers and may lead to the formation of a bar. Likewise adverse conditions of health drain the blood from the feather and may even wholly arrest the growth midway, as not unfrequently happens in young chicks. Occasionally a bird is found in which the blood pressure is constitutionally weak, and in this case the barbules of the feather are more or less wanting from clipping to clipping. In any reduction of blood pressure the barbules are the first to suffer, seeing the cells which form them are furthest from the supply of blood in the middle of the green feather. A temporary diminished blood pressure may be brought about by eating certain weeds, and this results in a diminished formation of barbules across the feather.

Birds poorly fed or farmed in unfavourable localities have not the maximum nourishment going to the stem and consequently the feathers produced are inferior in quality. As a result of prolonged experience, supplemented by experiment, it is becoming abundantly evident that all epidermal structures are peculiarly subject to nutritive changes, and on account of their size and delicate structure the plumes of the ostrich stand unrivalled for a study of these changes.

5. THE REPRODUCTIVE SYSTEM.

The *reproductive system* provides for (1) the production and liberation of two kinds of germ cells, eggs or ova in the female and spermatozoa in the male; (2) the union or fertilization of one kind of germ cell with the other, that is, the egg with the spermatozoon; and (3) the production from the fertilized egg of a chick.

The organs producing and liberating the germ cells are the gonads, that in the female, producing the eggs, being the ovary, and that in the male, producing the spermatozoa, being the testis. Besides these essential organs there are many accessory organs for bringing the two germ cells together and adding nutritive materials and coverings to the egg.

The Male Reproductive Organs.

The reproductive organs in the cock comprise (1) a pair of testes or testicles which produce the spermatozoa necessary for fertilizing the egg; (2) a pair of ducts or tubes, the *vaxa deferentia*, which convey the sperm to the cloaca; and (3) the male copulatory organ, the penis, by means of which the spermatozoa are conveyed from the cloaca of the cock into that of the hen where, passing up the oviduct or egg tube, they reach the egg and fertilize it.

The *testes* are two long, narrow organs situated against the back of the bird on the right and left sides, at the inner, upper end of the kidneys and near the adrenal bodies. Each is suspended from the body-wall by a fold of mesentery. The organs vary much in size and appearance according to the age and sexual condition of the cock. In very young chicks they can be seen as two white, rather worm-like

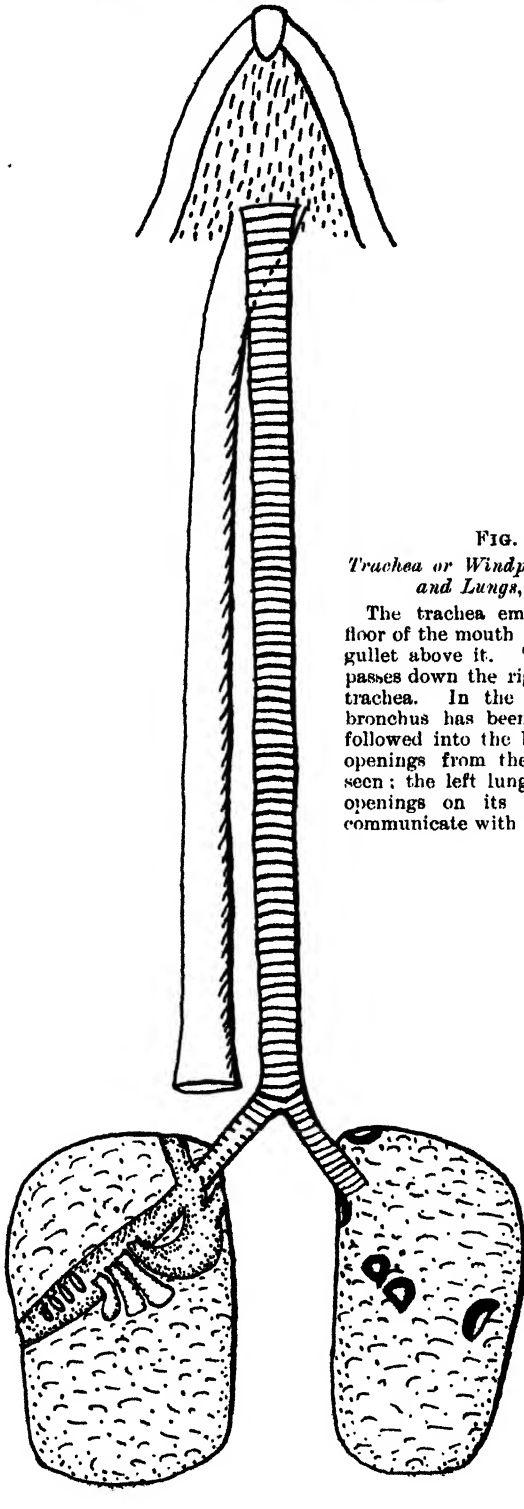

FIG. 3

Trachea or Windpipe, Bronchi, and Lungs, Gullet.

The trachea emerges from the floor of the mouth along with the gullet above it. The gullet then passes down the right side of the trachea. In the right lung the bronchus has been slit open and followed into the lung where the openings from the vestibule are seen ; the left lung shows the five openings on its surface which communicate with the air-sacs.

bodies, about half an inch in length, near the middle line, underlying the first lobe of the kidneys, the left a little lower than the right. In a bird about a year old they reach nearly the size of one's little finger, but rounded at each end, and yellow in colour. In the ripe cock they enlarge to about the size of the fist, but diminish each year with the close of the breeding season, enlarging again as the next breeding season approaches. They are also non-active during the nesting period.

Each *vas deferens* or *sperm duct* is a straight narrow tube, coming off from the border of the testis and passing over the neutral surface of the kidney to the cloaca into the middle chamber of which it opens a little outside the opening of the ureter. No accessory sexual glands occur in the male ostrich.

The *penis*, also a part of the male reproductive organs, has already been described. Castration, or the removal of the testes, is now frequently practised on cocks unsuited for breeding purposes. Their removal takes away any further possibility of the production of spermatozoa and of other secretions which induce the secondary male characteristics, such as the scarlet colouration of the torsal scintillations and the beak, as well as pugnacity and bromming. If the removal of the testes is performed after the adult plumage is assumed, there appears to be no loss of blackness in the feathers, while the nutrition formerly going to them is available for other purposes in the body.

The attainment of sexual maturity, involving ripening of the testes is usually reached in well fed cocks when between two and three years old, but can be greatly hastened by a high nutritive condition.

The Female Reproductive Organs.

The *female reproductive organs* (Fig. 1) comprise (1) an ovary in which the eggs are formed and (2) an oviduct or egg-tube which conveys the eggs to the exterior through the cloaca. In the ostrich, as in all other birds, only a single ovary and oviduct are functional, situated on the left side; the right ovary has wholly disappeared and only a vestige of its oviduct remains. The ovary is situated towards the inner upper end of the left kidney, close under the hinder border of the liver, and varies much in size according to the age and sexual condition of the hen.

In young chicks the ovary can be recognized as a small oval mass, pale in colour, and about half an inch in length, resting on the uppermost lobe of the kidney. In mature birds it resembles a bunch of grapes. Many hundreds of yellow eggs of all sizes are contained in it, varying from the size of a mustard seed to that of a full-sized yolk. Each ripe ovarian egg, contained in a capsule, hangs by a separate stalk from the surface of the ovary. Under a high state of nutrition hens can be brought to sexual maturity before two years old.

During the breeding season, from twelve to sixteen eggs attain maturity at about the same time, and one is laid on alternate days until the number is exhausted and the hen has then completed her nest of eggs. If the nutritive condition is deficient a less number of eggs will ripen and be laid. If the condition is good, and the eggs are removed as laid, a hen will continue producing eggs almost throughout the season. Under very high stimulating conditions a hen can be made to lay daily instead of on alternate days, as in the

writer's experiments. Prolonged inclement weather checks the production of eggs.

The *oviduct or egg-tube* (Fig. 4) is a long, partly folded, stain-like tube, beginning with a wide mouth known as the infundibulum.

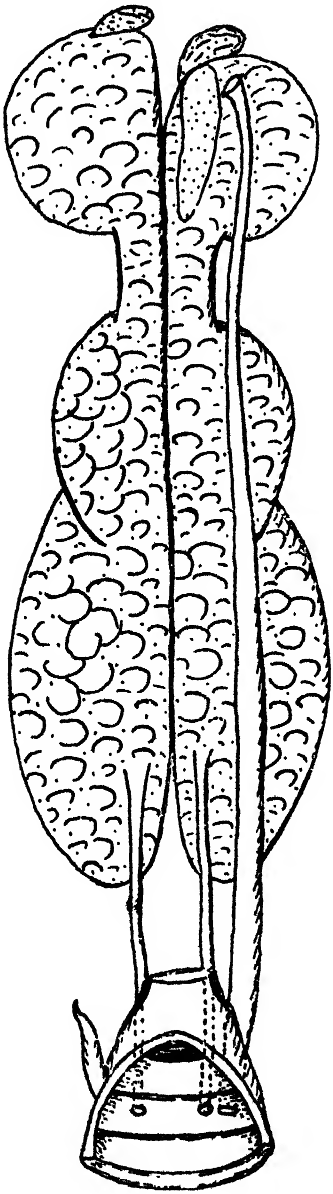

FIG. 4.

Kidneys, Ovary and Oviduct, Cloaca.

The right and left kidneys come together in the middle line. Each is trilobed and the left is a little lower than the right. At the top are the small rounded adrenal bodies. The ureters come off from the lowest lobe and open into the middle chamber of the cloaca below.

The single ovary lies over the first lobe of the left kidney and the oviduct commences near it and passes as a straight tube to open into the cloaca near the opening of the ureter. The rudimentary right oviduct is seen on the other side.

The cloaca is drawn with its ventral face removed so as to show the three chambers inside and the openings into them.

It lies close against the ovary and receives the ripe egg as it bursts free from the ovary. In chicks and young birds the oviduct is a straight, narrow, pale tube lying upon the left kidney, but in breeding hens it becomes enormously enlarged, with crumpled walls, and is

richly supplied with blood. It is held in position by a fold of peritoneum, the broad ligament.

The oviduct admits of division according to the function which it performs in different parts of its length. The first and longer part is the oviduct proper, and its walls secrete the albumen or white of the egg and the two shell membranes. This is succeeded by the uterus, in which the hard shell is formed by the secretion of lime salts from its woll. From here the egg passes into a short vagina, which in its turn opens into the middle chamber of the cloaca, side by side with the left ureter from the kidney. Usually only one egg is present in the oviduct at a time.

The Egg.

It is very necessary that the farmer should have a clear understanding of the nature of the egg of the ostrich and of the function performed by each part of the reproductive organs of the hen. An ostrich egg as laid is a somewhat complex body. The real egg or ovum consists only of the yellow part or yolk, and this is produced in the ovary and bursts from its capsule when ripe. The yolk is surrounded by a very thin vitelline or yolk membrane which prevents it from "breaking", and is also formed before the yolk leaves the ovary. At one spot the ripe egg contains a nucleus or germinal vesicle, and it is from this microscopic part, the real germ of the egg, that the chick forms after the egg has been fertilized. The rest of the yolk is so much nutritive material provided by the parent bird for the developing chick and, as already seen, is not wholly exhausted when the chick hatches, but passes into its body as the yolk-sac or yolk-stomach. All the parts outside the vitelline membrane of the yolk, such as the albumen, shell-membranes and shell, are so many accessories to the true egg.

When the egg is ripe it bursts from its ovarian capsule and is caught by the lips of the infundibulum and passes into the oviduct, down which it proceeds slowly, aided by the muscular contractions of the wall of the tube. In the uppermost part of the oviduct, however, it receives the male germ cell or spermatozoon, without which it would be unfertile or incapable of producing a chick. The nucleus or head of the spermatozoon fuses with the nucleus or germinal vesicle of the egg, and from the two a new nucleus, the first segmentation nucleus, is produced. Necessarily this new nucleus contains the characteristics of both parents, and thus we have a basis for heredity. Shortly after fertilization the process of segmentation or division of the germ cell commences. It proceeds as the egg winds its way down the oviduct, to be suspended when the egg is laid, but renewed upon incubation.

As it proceeds down the oviduct the egg, whether fertile or not, receives several protective coatings, secreted by the walls of the tube. The first is the white of the egg or albumen, a clear, colourless viscid albuminous fluid, which coagulates to an opaque white on boiling. The egg rotates in its descent, and a denser spiral part of the albumen, known as the chalaza, is connected with each of its two ends and serves to balance the yolk suspended in the middle of the surrounding albumen. The albumen is a highly nutritive material and, like the yolk, serves as food for the growing chick. The yolk, however, is slightly heavier than the albumen, hence when eggs are laid it is necessary "to turn" them, once or twice a day, otherwise the

yolk would settle and stick fast to the shell membrane. The duty of turning the eggs is performed by the parent birds so long as the eggs are in the nest, but must be done by the farmer if the eggs are removed.

After the deposit of albumen is completed the tough, fibrous shell membranes are secreted from the wall of the oviduct. These are two in number, and the white material of which they are composed is laid down in a spiral manner, easily seen if an attempt is made to strip off small pieces without breaking through to the albumen. The air-chamber forming later, as a result of evaporation from the egg, comes between the two shell membranes.

The hard *calcareous shell* is next laid down over the shell membranes by the activity of lime-secreting cells in the wall of the

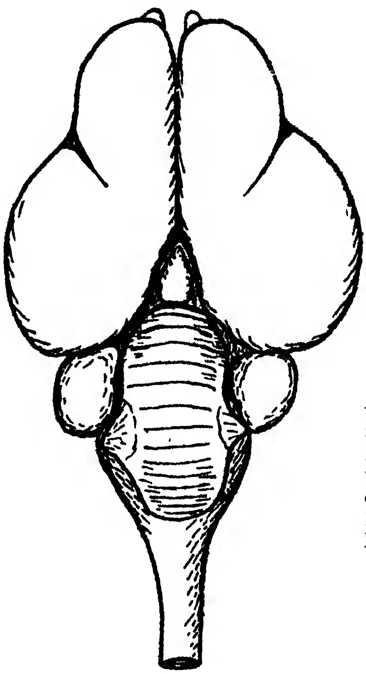

FIG. 5.

The Brain.

Above are the two cerebral hemispheres with the small olfactory lobes just showing. Next is the cerebellum with an optic lobe on each side. Behind is the *medulla oblongata* passing into the spinal cord, severed from the rest of the cord. In the angle between the two cerebral hemispheres and the cerebellum is the rather large pineal body.

uterus, the uttermost deposit being enamel-like and pale brownish-yellow in colour, bleaching on exposure to sun. The thick shell is finely porous so as to admit of gases and vapour passing through it. The microscopic perforations or canals are connected with the small pits or pores seen on the surface of the shell in the egg of the southern ostrich, but not on that of the northern bird. A " soft egg " is one in which the wall of the oviduct has failed to secrete the lime salts; occasionally the lime salts are not laid down evenly and the shell exhibits an irregular surface.

To recapitulate.—The true egg or ovum formed in the ovary consists almost wholly of yellow nutritive yolk, but has the microscopic female germ nucleus at one spot; it is surrounded by a thin delicate vitelline membrane; leaving the ovary the ripe egg passes into the oviduct and downwards in a spiral manner, fertilization taking place in the uppermost part by fusion of the male and female

germ nuclei; shortly after fertilization segmentation or division of the germ nucleus begins; passing downwards the white or albumen is poured over the egg, and lower down the two shell membranes form over the albumen; still lower the hard shell is deposited over the shell membranes, and the egg is ready for laying; on laying, segmentation stops, but is renewed on incubation. Later changes and the formation of the chick will be described in the section on embryology.

6. THE NERVOUS SYSTEM.

For the harmonious working of the various organs already described some regulatory influence is necessary. This is exercised by the nervous system, comprising the brain and spinal cord and all the nerves connected with them. Also the ostrich must be rendered conscious of its surroundings in so far as they concern its welfare and be enabled to act accordingly. This likewise is performed by the nervous system acting through the various sense-organs and voluntary muscles. A lack of proper co-ordination between the nervous system and the muscles is well illustrated in the trouble familiarly known as "staggers", where the bird is incapable of properly regulating its movements due to some nervous defect.

It is hardly necessary for the ostrich farmer to possess a knowledge of the many details of the nervous system. A sketch of the brain is given (Fig. 5), the remarkable feature being its small size and simplicity in comparison with the bulk of the body. It might be inferred from this, even were other evidence lacking, that the mentality of the ostrich is not of a very high order. It is a familiar saying that the ostrich exhibits little "sense", and its stupidity is held to be proverbial. Its mental processes, so far as they are revealed to us by its activities, are hardly beyond those involved in the simplest necessities of existence.

If we take as a criterion of intelligence the readiness to learn and adapt actions to the varying circumstances of life, the ostrich shows but faint glimmerings; certainly far below those of the wily barn-door fowl. The nervous activities of the bird are mainly those known as "reflex", consisting of regulatory impulses taking place through parts of the brain and spinal cord without involving consciousness.

The ostrich seems to be practically unconscious of pain, but is very ready to take alarm at strange sights. His sense of sight is very keen, less so his sense of hearing, while those of taste and smell are feeble.

Facts and Theories about Stijfziekte and Lamziekte.

(PART II.)

Rickets, Osteomalacia, Osteoporosis, and Pica.

By Dr. A. THEILER, C.M.G., Acting Director of Veterinary Research.

IN various diseases it is accepted or has actually been proved that there is an absence of lime and particularly phosphate of lime in the skeletal system of affected animals, and this fact has been the reason for the formation of speculative theories adducing the lack of phosphates in foodstuffs to be the cause of the diseases themselves. This being so, and similar deductions having been made with regard to South African Stijfziekte and Lamziekte, I consider it advisable to review our knowledge of the diseases mentioned in the sub-title, in which the absence of phosphates is considered to be established.

In the subsequent notes I have consulted the publication of Hutyra and Marek, "Spezielle Pathologie und Therapie der Haustiere", a work published in the German language by two eminent professors of the Veterinary College in Budapest, and which is considered to be the most up-to-date and complete record of our knowledge of animal diseases. I have also taken into consideration the diseases of man, known under the same name, in order to record our knowledge of their causes, and have for this purpose consulted Abderhalden's "Physiological Chemistry", which book may be considered the most modern one on the subject.

Finally I have given careful attention to a publication of Ostertag and Zuntz, on a disease called "Pica", or *abnormal craving in cattle,* which has been investigated experimentally, and the results leave but little doubt as to the cause of this disease. These results may help to throw some light on our own diseases.

Rickets.—Rickets is a disease of young animals due to a disturbance of the metabolism, by which the newly formed bone tissue remains in the osteoid stage, and a proliferation of the cartilagenous tissue takes place; the ossification process proceeds along irregular lines, and as a result of this various deformities of the skeleton occur.

The animals are usually attacked in *their first year,* more often when they are a few months old or *after they have been weaned.*

The animals most frequently affected are young pigs, puppies, lambs and kids; foals and calves are not so often affected; birds may also suffer from this disease.

As the animal grows most quickly after weaning it is thought that any shortcoming of lime during this period would manifest itself.

Symptoms.—Deformations of the bones are the prominent features. The epiphyses (viz., the ends of the long bones) are enlarged, giving the affected joint the appearance of being swollen, but on probing with the fingers the true character of these enlargements can easily be ascertained. Similar enlargements are also met with on the cartilagenous ends of the ribs; two rows of bony knobs can be recognized to run parallel to the breast-bone. This symptom is more particularly found in canines.

The weight of the body and the tension of the muscles cause the bones to bend. This is principally seen in the fore legs. The bones may be bent in any direction, and accordingly all possible shaped legs are noticeable.

Through the weight of the shoulder and the elbows the ribs are compressed, their middle portion bends inwards, and the diameter across the chest is thus shortened; the distance between the vertebrae and breast-bone widens, and the two margins of the latter bone draw together, forming an acute angle, so that the sternum becomes "keel-shaped".

In animals which frequently lie down, e.g. cattle, the diameter from the vertebrae to the breast-bone becomes on the contrary shortened.

On the pelvis both acetabulae are pushed upwards and inwards by the articular extremities of the femurs, the symphsis is pushed forward and downwards, and accordingly the pelvis becomes narrower; the inward deviation of the upper part of the hind legs is indicative of this deformation.

The vertebral column shows various deformities; it may be bent to one or the other side, upwards or downwards, and even combinations of these irregularities may be noticeable.

Deformation of the skull also occurs, the thickening and bending of the lower jaw and the thickening of the bones of the face gives the head a swollen appearance. This impairs breathing and feeding.

The course of the disease is a slow one. The animals lose in condition, do not thrive well, and remain stunted in growth. Occasionally it is noted that the bones break suddenly without apparent cause. The symptoms which are so marked in the bones and which leave traces behind even in cases of recovery are sometimes preceded by general symptoms of a passing nature. To these belong disturbances of the nutritive functions. The young animals do not feed well, the abdomen becomes distended, and occasionally diarrhoea is seen; they show a depraved appetite and *an abnormal craving which causes them to gnaw stones and woodwork.* Most of these symptoms are overlooked at the commencement, and only peculiarities in the movement of the animal attract attention; these symptoms are caused by pain in the bones before they have actually started to deform.

Post-mortem Lesions.—The epiphyses of the bones are enlarged and thickened. The diaphyses are shortened. The bone tissue appears porous and is softer than normal, sometimes so soft that it can be cut with a knife. If a bone is cut in its longitudinal direction one notices between the periosteum and the bone substance a soft spongy layer with congested blood vessels, which, on removing the

periosteum remains partially attached to the bone. This layer is particularly noticeable on such places where sinews and muscles are attached, where occasionally exostoses are noted. The limit between the cartilage of the epiphysis and the diaphyses (which in normal bones is characterized by a bluish-white or yellowish double stripe) is broadened, forming a much wider, spongy, soft, and red tissue without definite borders. Occasionally the connection between the epiphyses and diaphysis is loose, and it is sometimes possible to tear these portions of the bone asunder. The yellow marrow of the bone appears more or less reddened and gelatinous, particularly when the animal is in a poor condition. The spongy substance of the bone also shows a reddish tint, and a rarification of the cancellated tissue becomes noticeable. Occasionally an inflammatory condition of the same joints is present, the cartilage showing ulcerative defects.

The Cause of Rickets.—It is important to know whether Rickets, as described, can be produced in an experimental way, and more than 60 years ago the first attempt was made to prove that the want of lime salts was the cause of Rickets. The experiments were made with young pigs and puppies by feeding them with foodstuffs deprived of lime, and lesions were produced which, from *inspection with the naked eye*, corresponded to Rickets, viz., swelling of the epiphyses, softening of the bones, and subsequent deformation. On the other hand a number of experiments did not succeed in producing any lesions in the way indicated, but it was thought that this result was either due to carrying out experiments for too short a period or that the experiment was frustrated by a complete withdrawal of all nutritive salts in the food supplied.

Since these experiments were undertaken, it has repeatedly been pointed out that they do not by any means prove that the disease produced by the withdrawal of the lime-salts was not identical with Rickets, and when the bones of the experimental animals were examined microscopically, it was found that the pathological process was quite of a different nature. Thus the correct interpretation of this experiment would be that in young growing animals a disease of the skeletal system can be produced when the lime-salts are withheld, accordingly the necessity of such salts for the proper development of the bones has experimentally been demonstrated. But this fact was not astonishing. We should very likely produce a disease if we withheld other salts, such as sodium chloride, iron, etc. *Nevertheless we may accept that, under the conditions of the practice, when foodstuffs poor in lime-salts represent the main food, a coincidence of conditions may occur, and then diseases similar to Rickets in young animals may follow.*

It is a noteworthy fact, borne out by experiments, that the supply of phosphoric acid to animals, when extended over a long period coincidental with the withdrawal of lime-salts, produced a disease resembling Rickets in young animals, and, finally, it was shown that it was not even necessary to withdraw the lime-salts at all; an increased amount of phosphoric acid had the same effect.

Thus here we would have the paradoxical effect that material required for the growth of bone may form the cause of the disease when apparently given in an overdose.

In Freiberg, Germany, it was noted that metallurgical factories emitted smoke containing arsenic, lead, and sulphurous acids, and the cattle grazing in the neighbourhood contracted *Rickets* and *Osteomalacia,* but these diseases disappeared when the smoke nuisance abated.

The disease, Rickets in children, has been observed under the best of conditions *notwithstanding the administration of lime-salts.* It can, therefore, be concluded that the want of these salts is not responsible for the disease, and our present knowledge permits us to draw the conclusion that the disease cannot be attributed to a lack of lime in the diet of the child.

Milk, which is invariably the basis of infant diet, contains more lime than almost any other article of food, so that the individual receives relatively more lime when an infant than at any subsequent period of his life.

Osteomalacia.—This is a disease resulting from disturbances of the nutritive system leading to an increased resorption of lime-salts in the bones and accompanied with deformation and fractures of the skeletal system.

It principally attacks cattle and of these cows in calf. It is less frequent in goats and pigs and still more rare in horses and mules. Sheep also show it, whereas dogs and birds are only attacked in quite exceptional circumstances.

Symptoms.—Those which point to an affection of the bones are the result of pain in these parts. The animals frequently lie down, do not like to rise, and only move when forced to do so. When standing the back is arched, the legs are spread, and are lifted alternately. The pains occur intermittently and suggest rheumatism. The movement is somewhat stiff, lameness is occasionally noticed on one or the other or on all four legs. Frequently, on rising or moving, a crackling noise is noticed. In the lower parts of the feet (hock and coronary pedal joint), as well as in the sheath of the flexor tendons, swellings are frequently noticed accompanied by inflammatory processes.

Meanwhile a decrease of the firmness of the bones becomes noticeable, and they may bend or break without any apparent cause. Fractures are most frequently met with in the pelvis, ribs, and in the bones of the upper part of the limbs. This is more particularly the case with horses. The bending of the bones are less frequently found, and, if present, are met with in the bone of the ribs, limbs, or vertebral column.

In the later stages of the affection, swellings of the bones of the head are noticed; this is, however, a symptom only exceptionally met with in cattle; it is more frequent in horses, pigs, and goats.

The course of the disease is very slow, lasting months, and if this change takes place in outside conditions it leads to poverty, inability to rise and feed, and, finally, exhaustion.

A characteristic symptom which precedes all others, but which is only typical for cattle, is the *abnormal craving which persists, so to say, throughout the length of the disease.* The animals will lick anything and everything they can get access to; they will pick up any material, chew it, and swallow it. In a later stage they will eat repulsive material, such as dung, etc. The appetite may become so altered that, finally, they refuse the good food and go for any

repulsive matter that they can find. As a result of this, a loss in condition, naturally, takes place; they become hide-bound, there are disturbances in the digestion, and constipation and diarrhœa become noticeable.

Post-mortem Lesions.—In far-advanced cases the spaces occupied by the marrow of the bones become enlarged and widened, the cortex of the bone is thinner and spongy, friable or soft, and can easily be cut with a knife. In very severe cases the cortex is only a few millimeters thick, the marrow is vividly reddened and occupies blood points; if cachexia has developed then it is gelatinous and watery. The wide, flat and short bones are also friable and soft. Deformation of the pelvis, the vertebral column and of the ribs, a narrowing of the chest, and a protrusion of the breast bone are noticeable. Frequently the formation of a new callus is met with on the ribs and bones or on the places of fresh fractures. Separation of the sinew from the bones and defects of the cartilages of the joint may be noticeable.

In later stages the lesions of anaemia and hydraemia with oedematous infiltrations develop.

Cause of the Disease.—Similar to Rickets, experiments were made to produce Osteomalacia. Pigeons which were exclusively fed on wheat developed it; further, it was produced in a dog, goat, and a sheep. A bitch, which from the beginning of pregnancy was fed with food poor in lime-salts, developed softness of the vertebral column and of the pelvis.

The indirect proofs are to the effect that the disease is met with in regions with unfavourable tellurical conditions, where the soil is poor in minerals, principally in phosphoric acid and lime. Certain seasons, distinguished by dryness, seem to foster the disease, and this is explained that, through want of rains, the minerals of the soil are not dissolved and cannot be resorbed.

Also sour grasses in moors and marshes are considered to be the cause, and they are said to contain less salts and proteids than the good grasses. This must be regarded as a coincidence, and it has yet to be proved that the minerals in question are wanting.

The moment of predisposition for Osteomalacia seems to be during the periods of pregnancy and milk production.

No definite deduction can be made from these statements, but Osteomalacia in cattle will appear in quite a new light when we have consulted the notes of Ostertag and Zuntz on "Pica".

Osteomalacia of women is a disease which occurs occasionally during pregnancy. It would seem probable that this disease bears some relation to the increased requirement of lime-salts on the part of the organism of the mother. The child develops at the expense of the mother's tissue. All that we know concerning the disease, however, is contrary to this assumption. Its appearance is not restricted to the period of pregnancy. It is at such time, however, that the symptoms are most pronounced, and usually the disease then progresses more rapidly.

Considering all these facts together, we are led to the conclusion that the disease is not caused by the lime being given up to the organism of the child, but there is evidently a severe metabolic disturbance of the bony tissue.

But, just as in the disease of Rickets, the lime plays a more or less passive part, it is indeed highly probable that here, again, the absence of lime is not directly responsible for the trouble, *but that the loss of lime takes place secondarily as a result of the disease.* The lime is loosened from its state of combination in the bones, and is eliminated as refuse out of the system. The primary trouble is a disturbance in the economy of the bony tissue.

As to the nature of the disease, the following notes are important: Fehling's observations that removal of the ovaries serves to check the disease has shed a peculiar light upon the nature of the disease. After this operation lime is once more retained by the system, and the newly-formed osteoid tissue calcifies. At present we can merely assume that the loss of the ovaries brings back the metabolism to normal paths. We may suspect that the ovaries have previously produced something which has caused the metabolic disturbance. Such an hypothesis, however, had not up to the present time been established experimentally. We must for the present be content with the knowledge of the observed facts and await a fuller explanation of the peculiar or mutual action between the ovaries and the bony tissue as a result of further investigation.

Thus it is evident that the cause of Osteomalacia in women has no relation to the want of lime-salt in the foodstuffs at all; it is a disturbance of the metabolism, the cause of which has not yet been established. Inasmuch as Osteomalacia is found in women, and principally amongst pregnant women, a certain relationship exists between this disease and that of the same name in cattle, the cause apparently being connected with the sex.

Osteoporosis or bone disease of horses is considered to belong to the same group as Rickets and Osteomalacia. Some authors are of opinion that the pathological process is identical with the lesions in Rickets and Osteomalacia, and that Osteoporosis is only unusually pronounced in horses where it is easily recognized as "big head". This disease is also considered to be connected with the metabolism of phosphates. As a support of this view a number of analyses were brought forward to show that not the want of phosphates is so much the cause of this disease as the unproportional low ratio of the phosphoric oxide to the lime. This conclusion is decidedly erroneous as far as Osteoporosis in South Africa is concerned. The foodstuffs analysed were not samples of the material with which the horses were fed. The observations in South Africa clearly indicated that an agency of a different character, in the nature of an infection, plays a role in this disease, and the loss of phosphates in the bones, which seemed to have been proved to be present, must also be considered not to be the primary but the secondary lesions. It is indeed nothing else but a sequel, the disease being a productive inflammatory process in the bone tissue, when new, non-calcified tissue is formed; this replaces the old tissue which disappears and the salts present are resorbed and probably eliminated.

It is not justifiable to compare the South African Osteoporosis of horses with Rickets and Osteomalacia of cattle. They are altogether different diseases, but there is a disease noticed in horses in Europe with similar symptoms, also called Osteoporosis. This disease is found in horses fed exclusively on bran, and for this reason is frequently alluded to as "bran disease". In this case the ailment

seems to be connected with the foodstuffs in as much as bran contains a large amount of phosphoric oxide, the proportion being one part of phosphoric oxide to 0.09 parts of lime, but *here again it would appear that it is not the deficiency but the surplus of phosphates which causes the disease.*

Pica or Abnormal Craving in Cattle and its Sequel.—We understand, under the name of "Pica", a disease in cattle of a chronic nature, accompanied with disturbances in the digestive organs and nervous system. The animals first show a lack of appetite and suppressed rumination and occasionally constipation. Then they do not touch their usual food and develop an abnormal craving for indigestible matter, such as mortar, stones, wood, ropes, pieces of cloth, etc. In the early stages the cattle lick the walls and mangers and on rare occasions their neighbouring animals. In advanced stages this craving lasts almost constantly during day and night. When out of the stable such animals scrape away the ground and, contrary to their usual habit, will eat coarse grass and the young shoots of trees and shrubs. As soon as the abnormal appetite has developed, the animals lose in condition and waste away to a mere skeleton.

This disease is principally noted in heifers, cows, and young animals. It is of an enzootic nature, stationary in certain areas, and appearing principally in the winter. In certain localities it is present every year, whereas in others it occurs only occasionally, when conditions are not favourable for the growing of foodstuffs.

This disease was noted on the "Johannisberger Heide", situated in the moorlands of eastern Prussia, which had lately been improved by the so-called amelioration works, viz., a system of draining.

The Prussian Government appointed a commission to investigate into the cause of the disease, particularly as it had been stated that the amelioration work was responsible. The investigations showed that the disease was known in that particular locality before the area had been ameliorated, that it attacked principally young cattle which were fed with hay of the pasture, and that cattle which were fed on hay from sandy and loamy soils did not develop the disease.

The commission considered it their first duty to investigate whether the hay alone was the cause of the disease in question.

Accordingly two series of experiments were made, one in the neighbourhood of the particular area where the disease existed and the other one in Berlin.

At the first place (Johannisberger Heide) six calves were selected, born in the moorlands, and six from a healthy area. Three calves of each lot were placed in one group (I) and the same number in a second group (II). Group II exclusively received hay from a healthy area and group I a mixture of hays from the moorlands.

In Berlin also six calves from the "Johannisberger Heide" and six calves from healthy areas were placed into two groups numbered I and II.

A third group of two animals (one of which came from the moorlands) acted as controls. Group I of the Berlin lot received hay from the unimproved moorlands, and group II from the ameliorated lands. The control animals were fed on hay obtained in the neighbourhood of Berlin.

The results were as follows:—In the first instance all calves began to improve, including those which were fed on the moorland

hay. This lasted for some weeks and then differences were noted. The animals which were fed on the moorland hay began to lose their appetite and condition and became infested with lice; at the same time they commenced gnawing and licking, losing flesh rapidly, and some died. The first animal in the "Johannisberger Heide" died ten weeks after the beginning of the experiment, having lost in weight during this period from 112 to 90 kilo. In the post-mortem examination the following lesions were noted:—Wasting of muscles and big glands (liver, etc.), *wasting of the cortex of the long bones and abnormal brittleness.* excessive anæmia.

The corresponding control calf (a calf from the moorlands, but fed on normal hay) improved in the meantime from 70 to 102 kilo.

The remaining five calves, fed with moorland hay, offered a miserable aspect. They were gnawing wood, ate old paper and cloth. They were weighed and showed that no increase had occurred since the start of the experiment.

The control animals, viz., those fed on normal hay, had gained an increase of 25 per cent. in weight. All these control animals looked healthy, had sleek hair, and were free from all diseases. Subsequently, of the calves fed on moorland hay in the "Johannisberger Heide", three more animals died, and they showed similar lesions to those already described.

In Berlin it was also noted that all animals improved in condition at the commencement and in those of group I this improvement was more marked than in those of group II. About six weeks after the experiment started the first symptoms of Pica were noticed, but they disappeared later and the animals improved.

When inspected about four months after the start of the experiment the animals of group I showed an increase of 13 to 37 per cent. in weight.

The animals of group II, however, started to lose again in condition, and, when inspected, only showed an increase of 4.5 per cent. in their weight. They were all poor, had bad coats, did not feed well, and were gnawing pieces of leather and rope; they also ate paper and cloth when put in front of them. Subsequently some animals died, again showing the symptoms already referred to.

The control animals, fed in Berlin with normal hay, improved considerably, the one 41 per cent. and the other 61 per cent. of its initial weight. They never showed any illness.

In the course of the experiments eight quantitative analyses were made, but there was no difference in the digestibility of the organic food material in the unhealthy hay as compared with the healthy hay.

A chemical analysis of the hay showed a decrease in sodium, and accordingly there was a relative increase of potassium; *there was also a reduction in lime.*

The metabolism experiments showed that the decreased amount of sodium in the hay did not cover the want of the animal's system; more sodium was excreted by the urine than taken in by the foodstuffs, and at the same time a considerable amount of potassium salts were retained.

The retention of both limesalts and phosphoric acid was much less than would have been in the case of a normal growth of the bones.

These facts having been ascertained, it was thought to prevent and cure the disease by the administration of lime and phosphoric acid,

and also with iron salts. *The results were negative.* The compensation of the abnormal composition of the hay ash by the addition of the "wanting" material did not remove the ill effect of the moorland hay.

It was then thought that if the constituents of the ash have any significance, they should act on the growth of the vegetation. An experiment was then undertaken to manure a piece of land with sodium manure (Chili saltpetre) and some success was apparent. Further, it was thought that only certain plants may cause the ill effects, and it was shown that clover grown on the moorlands had *no ill effects.*

Subsequently, investigations were made to see whether the ill effects of the hay were apparent at certain periods in the growth of the grass, and whether by any specific preparation the hay could be rendered harmless.

Three tests were made:—

(1) Hay treated with boiling water.
(2) Hay treated with cold water, but alkalinized by ammonia.
(3) Hay treated with cold water rendered slightly sour by hydrochloric acid.

The idea was to remove any hypothetical poisons which may have been present in the hay.

Calves which were fed for five months with steamed hay had increased by 16.5 per cent. of their initial weight; after eight months, however, they sickened. It was thus shown that the steaming had some influence on the ill effects. The hay treated with ammonia or hydrochloric acid was in no way influenced.

An excellent means to remove the ill effect of the hay proved to be the overheating in the stack before it was sufficiently dry.

Mowburnt hay from one of the ameliorated lands was fed to calves for a period of four and a half months, at the end of which period they had improved by 32.9 per cent. of their weight, and the animals looked very healthy and were still in good condition after the lapse of another three months. Later it was found that the preparation of mowburnt hay must carefully be carried out in order to insure overheating.

Another result was the fact that cattle which were grazed on the pasture did not develop the disease, and increased during the five months of the experiment to 35-40 per cent. of their initial weight. Sick cattle also improved when placed on the pasture.

The administration of oatmeal, linseed, grass, clover, the addition of molasses, salt, etc., did not cause any improvement in sick cattle.

The fact that the grass, when eaten green off the pasture, did not cause the disease, and the fact that the grass of the same pasture when turned into hay did cause it, led to further investigations as to a reason for this peculiar phenomenon. It was not likely that the process of the preparation of hay would be responsible for the disease, but there was an apparent difference in the grass eaten on the pasture and the grass eaten as hay. The latter belonged to that stage in the plant life when it was in flower and mature, whereas the former belonged to the earlier stages. It is possible that plants, which are harmless in the

immature stage, contain noxious constituents when ripe. The experiment was carried out in the following manner:—Instead of the usual two cuttings of the grass, three were made and turned into hay. The first cut was made so early in autumn that a fourth cutting could grow which, however, being frost bitten, could not be cut. *The first cut did not produce any disease; the second and third cuttings produced the disease.*

A further experiment was made with the "aftermath" of an ameliorated moorland. Three animals which were fed only developed abnormal "licking and gnawing".

The last experiment was made with clover hay grown on the moorland and fed to calves. Control calves received hay off the same area. The result was that at the conclusion of the experiment the clover-fed animals had increased by 5 per cent. above the weight of the grass-fed animals. The effect of the grass collected that year (1905) was not so noxious as in the previous years of the experiment (1902, 1903, and 1904).

The results of the above-mentioned experiments, which were undertaken by Ostertag and Zunst, can be summarized as follows:—

1. The hay of the moorlands of the "Johannisberger Heide" can produce the disease "Pica" in cattle.

2. The hay of the improved lands (ameliorated) shows this effect in a higher degree than that of not ameliorated pasture lands.

3. The "disease-causing effect" of the hay on one and the same pasture varies in various years.

4. The Pica caused by the hay has to be considered as an intoxication, which affects the feeding and the metabolism, particularly that of the blood and bone formation, and is further characterized by the abnormal craving.

5. The nature of the poison or of the poisons has not been established, but since the hay causes the disease only after it has been fed over a long period, it must be concluded that the poison is contained in the hay in but small quantities, and that its effect must be of a cumulative nature. It is possible that more than one kind of poisons is present, because the feeding with "aftermath" only caused abnormal craving without loss of condition.

6. Horses could eat the hay which proved so bad for cattle without any danger.

7. Steaming destroys the "disease-causing principle" to some extent.

8. Mowburnt hay of an infected area does not produce the disease.

9. Hay cut before the grasses have flowered did not cause the disease, but the second and third cuttings did so.

10. Hay off a portion of land manured with "Chili saltpetre" was less dangerous.

11. Grazing on the pasture does not cause the disease.

12. Clover hay grown on the affected moorlands does not produce the disease.

13. Animals suffering from "Pica" improve when placed on to the pasture, provided the disease is not too far advanced. Medicines and nourishing foodstuffs had no effect.

14. The administration of salt and calcium phosphates to the food in no way removed the ill effects of the hay.

CONCLUSIONS AND COMPARISONS.

The observations and experiments quoted in this paper enable us to form the following conclusions and comparisons:—

1. There exist several diseases affecting the skeletal system, in which a deficiency of phosphates of lime is accepted, but these diseases do not seem to be identical either in the same or different species of animals.

2. It has been proved that by feeding certain animals with foodstuffs poor in phosphates and lime, a disease of the skeletal system can be produced both in young and adult animals.

3. It has, however, not been proved that the absence of such salts in foodstuffs produce the diseases known as Rickets, Osteomalacia and Osteoporosis.

4. It has been shown that even the substances of which a deficiency is considered to be the cause of the disease can produce a disease when given in excess (phosphoric oxide), and it has further been noted that various causes must be responsible for the condition known as Osteomalacia and Rickets.

5. These diseases must be considered to be due to a cause directly or indirectly affecting the bony tissue whereby the metabolism of these parts becomes so affected that the lime-salts are cast out as waste products.

6. Rachitic and osteomalatic affections present themselves by general symptoms of malnutrition and indigestion, by swelling of the joints, particularly those of the distal ends of the legs, by deformation, by stunted growth, by brittleness of the bones, and by softening of the bony tissue.

7. Some of the disturbances of the metabolism of the skeletal system are preceded and accompanied by nervous symptoms such as a depraved appetite and abnormal cravings (Osteomalacia and Pica).

8. Comparing the descriptions of Rickets and Osteomalacia with the form of Stiffsickness in cattle described by Hutcheon, a certain resemblance can be noted.

9. It has been shown with certainty that at least one of these diseases (with abnormal craving as the main symptom, and characterized by the stunted growth of the animals) is due to toxic substances in the vegetation of certain soils, the toxin being of a cumulative nature, and its presence in the herbage being dependent on climatical conditions (Pica).

10. The disease Lamziekte, as described by Hutcheon, has in common with Osteomalacia only the symptoms of depraved appetite and abnormal craving, and none of the symptoms pointing to lesions on the skeletal system.

11. It has been proved that the toxic principle contained in the hay which caused "Pica" was dependent on the growth of the grass and on certain climatical conditions; and that the toxic principle could be destroyed by treating the hay in various ways.

12. It has been proved that the supply of salts and phosphates to prevent Pica due to vegetable poisoning was of no avail.

13. It appears that the symptoms of abnormal craving can be considered to be indicative of some intoxication with vegetable matters not yet known, and it appears further that several kinds of toxins exist which are responsible for the lesions of Osteomalacia and Pica.

14. The suggestion by Robinson that the Stijfziekte he observed in the coastal districts of the Cape was connected with the sour condition of the veld in that part of the country, finds an analogy in the causes of Osteomalacia and Pica.

15. The fact that cattle show Lamziekte only after they have been for some time, even many months, on a reputed Lamziekte area before they begin to develop the abnormal craving, and still later the disease, has a certain resemblance to results with the feeding experiments of hay made in Germany in connection with Pica.

16. Leaving the pathology out of the question, there is no other disease which, in its etiological features, has so many points of resemblance to Lamziekte as the Pica which was studied in Germany by Ostertag and Zuntz.

(To be continued.)

On the Rooibloem (Isona or Witchweed).

By H. H. W. Pearson, Sc.D., F.L.S.

A previous article on this subject* was written when the investigation of the life-history of this parasite was in its early stages. Since that time the greater part of the life-history has been worked out in the laboratory; the seeds have been made to germinate in large numbers; mealie roots have been infected by the young seedlings under artificial conditions, and the most important facts regarding the infection of the mealie crops in the field are now known.

The knowledge which has been gained in this way has shown that in any attempt to eradicate the rooibloem, we must give our chief attention to the seed and to the conditions under which it germinates. It is now certain that the mealie crop is infected by the seed alone. If the soil contains no rooibloem seed, the mealies are safe. If, on the other hand, rooibloem seeds are present in the soil, the mealies are almost certain to become more or less infected. When an infected mealie plant dies, the rooibloem dies also; it leaves nothing behind it except seed. *If, therefore a rooibloem plant is not allowed to set seed it does no harm except to the plant on which it grows; it cannot affect a future mealie crop.* In many districts the rooibloem which infects the mealie grows also upon the wild veld grasses as well as upon introduced pasture grasses. It is not yet certain that, in these cases also, the rooibloem plants die away completely at the end of the season; but it is probable. However this may be, we may rest assured that the rooibloem can only spread from the veld to the mealie field, or from one mealie field to another, in the form of seed. The seed is therefore a very dangerous stage in the life-history of the parasite; it is responsible not only for its continuance from year to year, but also for its spread from place to place. The rooibloem plant itself can damage only one mealie plant; a seed has within it the power of ruining a whole crop. On the other hand the seed and the very young seedling which results when it germinates are, in one sense, the weakest stages in the life of the rooibloem, for we can attack them with some hope of success, while, with the plant itself, we are powerless. It was pointed out in the last communication that the rooibloem is so intimately attached to the root of the mealie that there is no practical method of destroying the one without injuring the other. When once the mealie is attacked, cure is impossible. But if we cannot cure, we can at least do much to prevent the mealie being attacked. To do this we must concentrate our attention upon the seed.

Now, the rooibloem seed is, in many ways, a very remarkable structure. It is exceedingly small and it is produced in enormous quantity. The black oblong seed-cases which are found when the

* *South African Agricultural Journal*, Vol. 2, No. 3, September, 1911.

flower has fallen will be familiar to every one who has observed the plant. Each of these, when it opens, sets free hundreds of minute brown seeds. It is not easy to give an exact idea of the size of the seed. But if a quantity of it is mixed with fine silver sand, it will be seen that the average sand grains are larger than the seed. It will at once be evident that seeds which are as small as, and much lighter than, fine sand grains, are easily carried by the wind. Duststorms during the dry season are familiar to every one. The dust thus carried up into the air may travel for a very long distance before it reaches the ground again. If the dust is raised from a field infected with rooibloem, millions of these small seeds may be carried with it, and, if they fall upon cultivated ground, are ready to infect the next mealie crop. Duststorms we cannot prevent, but it is clearly of the greatest importance to do anything that is possible to ensure that the dust shall not contain rooibloem seed. These small seeds will also float in water—at least for a time. A surface flow of water—such as results from a heavy rain—will also carry them from one place to another.

The carriage of rooibloem seed by the wind is without doubt the principal means by which it is taken from one place to the other. It is such an effective means of distribution that other methods are comparatively unimportant. Every possible precaution should, however, be taken, and therefore attention may be drawn to a practice followed in some districts, which undoubtedly helps to spread this pest. When the mealie crop is harvested the cobs are thrown down in the field, and, sometimes at least, left there for a considerable period. If the ground is damp, soil adheres to the cobs; if the soil contains rooibloem seeds these are also carried away attached to the cobs. The seeds of the parasite thus find their way to the store, and while perhaps they do not often become attached to the mealie seed itself, yet they may easily be carried to a new field or another farm with the dust in the sack. Even if only a few seeds are carried in this way each of them may mean one rooibloem plant in the next mealie season and a thousand a year later. It therefore follows that *the mealie cobs should not be placed on the soil of an infected field.*

Investigations during this summer have shown that germination only occurs when the seed lies very close to—probably in actual contact with—a root on which the rooibloem will grow. There are a number of these "host" plants of which, unfortunately, the mealie is the one on which it thrives best. Even in a mealie field, seeds which lie half an inch or more distant from the nearest mealie root remain unchanged and do not give rise to rooibloem plants. It also is fairly certain that such seeds may remain alive for a number of years. There is naturally no complete proof of the truth of this statement at present, but many facts point in this direction. The appearance of rooibloem in one particular mealie plot in Zululand seems to indicate that the seed may remain dormant in the soil for five years. Evidence supplied by farmers in the Transvaal makes it probable that it can retain its vitality for periods even longer than this. It is therefore of no use to allow the land to lie fallow for one or two seasons. The rooibloem seed simply remains dormant in a clean fallow and awaits the next mealie crop. Similarly, it serves no useful purpose to grow crops which the rooibloem will not attack. For instance, rooibloem may occasionally establish itself

upon a peanut or a sunflower. But the vast majority of the seeds present in the soil lie dormant while these crops are in possession and only awake to activity when the next mealies are planted.*

From a practical point of view, then, the problem of the rooibloem is the problem of the rooibloem seed. If we can do away with the seed or prevent the young seedling from attacking the mealie, the rooibloem will be eradicated as soon as the seeds at present in the soil are destroyed or have germinated. There are three methods by which this much-desired result may be reached. These are:—

1. To prevent the rooibloem from flowering and setting seed.
2. To kill the seed in the soil.
3. To kill the young seedling before it attaches itself to the mealie root.

If it were possible to carry out any one of these methods thoroughly and successfully in every place where the rooibloem grows, eradication would be only a matter of time. This is, however, not possible, and theretore every farmer troubled with this pest is advised to put all three into practice as thoroughly and as soon as possible. From what has been already said it is clear that an infected farm is a source of danger to others in the neighbourhood. It is therefore of the greatest importance that measures for eradication should be generally adopted on all farms on which the par site has appeared.

Let us consider these methods separately.

1. *To prevent the Rooibloem from setting [illegible]*

The importance of this was pointed out [illegible] the first communication.† If the rooibloem be cut ou[illegible] [illegible] pulled up or otherwise destroyed before it flowers, no seed can be formed. In many places the expense of this operation will be considerable. It will not be of much help to the crop of the current year, for the more serious part of the damage is done before the rooibloem appears above the ground. But it will do a good deal to save the crops of future years. And if it is done thoroughly and regularly for a few years the land will be cleaned, unless there is new infection from outside.

2. *To Kill the Seed in the Soil.*

Although the seed is so small, it is nevertheless protected by a thick and exceedingly hard coat. But this coat is not able to protect the minute rooibloem plant inside it from the effects of a high temperature. It will often be possible to obtain a sufficiently high temperature by setting fire to the dead mealie refuse and weeds after the crop is harvested. This should be done as soon as possible after harvest, for rain washes the seeds down into the soil to a depth at which the fire does them no harm. Where a dense crop of rooibloem has been allowed to set seed it would be true economy to cart dried grass or brushwood on to the field, if there is not already sufficient refuse present, to make a strong fire. Recent investigations on the effects

* According to some farmers a crop of sweet potatoes is not attacked by rooibloem and yet has a beneficial effect in lessening the infection of a following crop of mealies. This statement has not yet been submitted to experimental proof.

† *Agricultural Journal*, September, 1911.

of the partial sterilization of cultivated soils by heat make it probable that the adoption of this practice would prove to be beneficial in other respects as well as in the destruction of rooibloem seed. In this way the seeds lying on or very near the surface will be killed; those at deeper levels will remain uninjured. These latter must be dealt with in another way.

3. *To Kill the Rooibloem Seedling before it attaches itself to the Mealie Root.*

For several months past experiments have been carried on in the hope of discovering some practical and economical method of doing this. These experiments have been conducted in Pretoria and in Capetown, and parallel results have been obtained in the two places. Some forty different plans have been tried, and each experiment therefore has necessarily been made on a small scale. Two at least of these plans promise to prove successful. But they involve expense and therefore cannot be recommended until they have been tried on a large scale under ordinary agricultural conditions. These more extensive experiments cannot be conducted until the next mealie season. When they are completed their results will be fully described in this journal. In the meantime another method which will produce the same result may be recommended. This may be described as a method of "trapping". It involves some waste, but until a more economical plan has been fully proved to be possible, it should be adopted wherever the circumstances will permit. Its application depends upon the following facts which have been established during this season's experiments. A rooibloem seed can only injure one host plant if the plant which springs from it is not allowed to set seed. It will attack various host plants, but it does not appear to do so much harm to any of them as to the mealie. In some parts of the Transvaal the rooibloem grows in considerable abundance upon the kaffir corn. The host plant in this case suffers, but it is not usually killed. If therefore a crop of kaffir corn is placed on infected mealie lands and *cut for ensilage as early as possible and the roots ploughed in before rooibloem flowers*, the land will be to some extent cleaned. In many cases it may be possible to follow this up with a mealie crop in the same season. But where two or three successive crops of kaffir corn can be grown in this way the rooibloem will disappear if no fresh seed is brought in from outside. *It must be emphasized, however, that the kaffir corn land must be ploughed up before the rooibloem flowers; otherwise more harm than good will be done.* The same result can of course be obtained by using the mealie instead of the kaffir corn. Here, also, the same precautions must be observed, viz., the mealies must be cut and the roots ploughed in before the rooibloem flowers. The kaffir corn is, however, recommended in preference to the mealie, because where the soil contains much rooibloem seed—especially where the land is poor or exhausted by much cultivation—the mealie is so badly attacked that the plant which results is of no use even for fodder. The kaffir corn, on the other hand, appears to be able to support a large number of rooibloem plants without showing marked signs of exhaustion in the early stages of its growth. The writer has seen kaffir corn badly infected with rooibloem, but yet sufficiently well developed and vigorous to yield a reasonably good crop of fodder.

So much at present for the rooibloem seed; one word about the mealie plant itself. Experience shows that the stronger the mealie, particularly in the early stages of its growth, the less is it injured by the rooibloem. The reasons for this are not yet fully understood, but there is no doubt that it is a fact. Therefore, *feed the mealie.* The application of kraal manure or of any of the fertilizers whose value when applied to mealie lands has been established by practice, is strongly recommended. And this enrichment of the soil when the mealie is sown is of far greater value than when applied at a later stage. At the same time it would be unwise to incur great expense in fertilizing lands which are known to be very badly infected, as it is probable that in these cases no amount of added food would enable the mealie to produce a paying crop.

SUMMARY.

1. Cobs should not be thrown on the ground in a field infected by rooibloem.

2. Rooibloem should be cut out before it flowers.

3. All available refuse on an infected field should be burnt where it lies after the crop has been harvested. This should be done as soon as possible after harvest.

4. A treatment of the soil to kill the seedling plants of the rooibloem will be recommended later.

5. A "trap" crop of kaffir corn cut early for forage and the roots ploughed in before the rooibloem flowers, reduces the amount of infection in the next mealie crop. If successive crops are grown in this way the land may be cleaned entirely and the rooibloem will disappear unless introduced again from outside.

6. Feed the young mealie with kraal manure or fertilizers. This treatment is not recommended where the land is known to be very badly infected.

In an investigation of this kind, results of laboratory experiments, while perfectly reliable for the conditions under which they are obtained, can only possess a practical value when they have been proved to be equally true for the conditions which prevail on the farm. The experience of a practical farmer is therefore of the greatest assistance to the scientific investigator. In so far as circumstances of time and space have permitted, the knowledge which farmers have acquired of the conditions under which this pest flourishes, has been freely used in these investigations. It is therefore hoped that farmers who have any experience of the methods of eradication recommended in this paper or of any others not mentioned here, will be so good as to communicate with the writer, who will be glad to correspond with any one who wishes to make any communication or inquiry on the subject. Letters should be addressed:—

Botanical Laboratory,
South African College,
Capetown.

Investigation of Chemical Problems in a New Country.

Presidential Address to the Cape Chemical Society delivered at the Seventh Annual General Meeting, Capetown, 19th April, 1912.

By Charles F. Juritz, M.A., D.Sc., F.I.C.

Exactly four years ago it was my privilege to address this society under circumstances similar to those in which you have again placed me to-night, and my first word must be expressive of thanks and appreciation for the confidence once more extended to me.

In my last inaugural address attention was directed to the fact that the year which we were then entering upon opened a new century in the history of chemical research. Occasion was taken by me to point out the differences between research and investigation; the hope was expressed that, in the years to come, and in a country such as this, agricultural chemical research in particular would be recognized as its inestimable importance merited: the lament was uttered that, while on the one hand the United States of America had been spending five million pounds sterling on agricultural research during the previous twenty years, we were seemingly contented to dwell in a kind of antipodes, waiting to meet the needs of each day as it arrived. The aim which I then placed before the society was the education of the public mind on the value and desirability of agricultural chemical investigation, if, perchance, we might bring about in the first year of the new century of chemical history, the initiation of a period of earnest investigation and research with regard to the chemical side of the problems bearing closely on the agricultural development of what was then still known as the Cape Colony.

All that was four years—four momentous years—ago. In the interval we, in this sub-continent, have entered not merely on a new century of chemistry, but on an entirely new phase of our national existence. The last few years have witnessed the first efforts of the young South African nation to feel its feet, and, although it is our united hope that future development may be swift and sure, we cannot on that account expect freedom from the propensity to stumble that invariably accompanies the endeavours of every infant to advance in an erect posture.

All new nations find awaiting them, at the outset of their national existence, problems of the most diverse character. Some of these problems are common to all young nations emerging into life; others are peculiar to the circumstances surrounding special cases. Whereas the cradle of the newly-born North American Union was violently tossed upon a tumult of popular feeling and buffeted by the distractions of extreme national poverty verging even upon bankruptcy, the Union of South Africa has been more peacefully evolved amid conditions of comparative plenty. And so we are the

better circumstanced calmly to survey the land which it is our good fortune to inherit and to dispose of ourselves thereon to the best advantage, neither hoarding nor squandering the undoubted opportunities for prosperity afforded us.

The problems which it is the function of chemical science to solve for us are many and varied. Some of them clamour for instant attention; others are content to await the slow grindings of years. What mistakes we shall make if we try to solve those of the latter class in a few moments! Yet, serious though such errors may be, they are trivial in comparison with the egregious blunder of leaving for the drift of years to settle the pressing problems that will brook no delay. See there, then, two mistaken lines of policy possible in respect of the chemical problems of a new country. To deal with them adequately, two qualities—amongst others—are needed, patience and promptitude; patience for the questions which only experience can answer, promptitude for the others which demand instant decision. I feel very deeply that if we, as a people, are ever to be well-balanced in thought, word, and deed, the manner in which we grapple the country's chemical problems will serve as an indication of our fitness for sound administration and of our chances of realizing a prominent position in the van of true civilization. The closing words of Professor H. E. Armstrong's address to the British Association at Winnipeg three years ago are not inapt just here:—

> Chemistry touches the drama of life at every point: if ever we are to understand life and regulate our actions in accordance with understanding, it will be in no slight measure because we appreciate the lessons which chemistry alone affords.*

In his famous "Letters on Chemistry", Baron von Liebig expressed an analogous idea in even stronger terms. He had been emphasizing the important bearing of chemistry upon physiology and medicine, commerce and the arts, mineralogy and geology, and even more particularly on agriculture, and then he expressed himself thus:—

> Without an acquaintance with chemistry, the statesman must remain a stranger to the true vital interests of the state, to the means of its organic development and improvement; his attention cannot become sufficiently alive, nor his perception adequately acute, in regard to what is really useful or injurious to his country—to society. The highest economic or material interests of a country, the increased and more profitable production of food for man and animals, as well as the preservation and restoration of health, are most closely linked with the advancement and diffusion of the natural sciences, especially of chemistry.†

The contact of chemistry with "the drama of life" is much closer and more constant than perhaps even Liebig ever imagined, and so it is in the highest degree needful that a new nation at the very outset of its composite existence should most carefully consider its relation to this all important science in its practical applications. And in the very forefront of our considerations let us give due heed lest we get shattered on the Scylla or founder in the Charybdis alluded to two minutes ago; let us avoid equally the errors of inordinate haste and of lethargic slackness.

The disastrous effects of a policy of undue haste in scientific matters have more than once revealed themselves to us here in South Africa, and for this the scientific expert has often been as much to blame as any one—perhaps more so. Nowhere have public demands and expectations been more unreasonable than in agricultural science,

* Brit. Assoc. Reports, 1909, Winnipeg, p. 454. † "Letters on Chemistry", No. 1, 1851.

and nowhere does the desire to attain results which will have an immediate practical application oftener lead to departure from the general principles by which all scientific research should be guided. This desire for dramatic effect, when indulged in, has not only resulted in failure—especially when striven after with inadequate resources—but it has discounted the sober ploddings of others who thoroughly recognized the principle that time is needed to develop processes and complete laborious investigations, and that short cuts lead nowhere else than to immature conclusions. But the thirst for sensationalism had been aroused and could not be quenched by anything so unromantic as the steady accumulation of results whose value, at present latent, would stand revealed only as the years advanced. What person of sense would choose a plot of cut flowers tied to laths jauntily stuck in the ground in preference to a collection of priceless bulbs that are still hidden below the soil surface because the season for emergence has not yet arrived? Unfortunately, as Professor Armstrong remarked in the address from which I have already quoted, "We have been living in a time of sensational discovery—in a period when advertisement is favoured and the desire for notoriety rampant".

Under these circumstances popular vision becomes warped, and we can never hope to have the chemical work of the country satisfactorily performed unless and until we have men of efficient chemical vision to perform it, to direct it, and to administer it. The actual worker in applied chemistry absolutely needs a proper mental grasp of the chemical problems of the country; incomparably greater is the need of this if he be expected in any sense to direct, control, or suggest lines of work. There is a strong feeling permeating the foremost chemists in England that Germany is steadily outstripping the British Empire in the matter of chemical industries. This is not because the German is a more practical man than the Englishman. At the time of the celebrations in connection with the jubilee of Sir William Perkin's discovery of mauve, Professor Carl Duisberg said that the German is primarily a theorist, but he possesses endless patience and works without any immediate prospect of pecuniary reward. There we have it; it is patience—not impulsiveness—that is fundamental to the qualities that mark a good research chemist. It was, moreover, strongly emphasized by Professor Kipping, when delivering his presidential address to Section "B" of the British Association,* that if chemical industry in England is to hold its own against foreign competition, "not only must we learn patience and perseverance, but we must also call to our aid the best brain-power available".

I could name some parts of the British Empire not very far distant from southern Africa where, when chemical appointments had to be made and the promotion of scientific research was supposed to be aimed at, neither acquaintance with the country's problems nor the possession of a high capacity for perseverance and taking pains were considered essential qualifications, while the brain-power on which Professor Kipping placed so high a value seemed to have been regarded as of no moment whatever. What the principle of action was in such cases it is difficult to conceive.

* Brit. Assoc. Reports, 1908, Dublin, p. 650.

In regard to most branches of science, South Africa is an almost new and unexplored field, and in chemistry particularly so. We scarcely know even the composition of the air above us or of the sea that washes our shores. We are justified in the inference that they do not differ materially from the air and sea of Europe or America, but the precise amount of difference, if any, until actually ascertained, remains a subject *for investigation*. In fact, only a few years ago, the staff of the Capetown laboratory was engaged in analysing and taking the specific gravities of many hundreds of samples of sea water collected at the instance of the Government Marine Biologist from numerous localities round our coasts. For more than a year past, under extreme difficulties, I have been endeavouring, in collaboration with similar investigations now being carried on all over the world, to give practical effect to a system of monthly analyses of rain-water from six localities in the Cape Province, and three each in Natal, the Transvaal, and the Orange Free State. Perhaps there might be some excuse, if such determinations as these were being made in and around the British Isles, for comparing their performance to the flogging of a dead horse, for it may be pardonable to suppose that there, at all events, everything that was to be learnt in those respects had been investigated many years ago; but the mere fact that nothing whatever had been known about these points in their peculiar relation to South Africa in itself gives them all the importance of a new line of investigation.

In almost every phase of chemical science South Africa teems with points awaiting investigation, and we ask ourselves when, where, how, and by whom these investigations are to be performed. Educational institutions, as at present constituted, are far from adequate to the task, and if they have not been found thus adequate even in England, with its multitudinous and highly efficient establishments, it is a possibility extremely remote that for many years to come circumstances in South Africa will be more promising. This straightway prompts the inquiry: What is the position in England? In my last presidential address reference was made to the authoritative opinions of Professor Meldola on "The position and prospects of chemical research in Great Britain". I would ask for the most careful attention to his observations in connection with the special point that we are now discussing:—

> With the exception of Manchester, it cannot be said that in any of our universities has there been called into existence an active centre of chemical research. . . . After making allowance for the few noteworthy exceptions, the actual contributions to our science from these centres are far below the standard, both of quality and quantity, which might be expected. . . . There can be only one conclusion: that many of our universities are distinct failures as centres of chemical research, and that the total output of work from university laboratories is by no means worthy of the great traditions of this country as a pioneering nation in scientific discovery.*

Of the more modern educational establishments as centres of chemical research, or even as centres for its encouragement on the part of others, Professor Meldola spoke, he said, with feelings of profound disappointment, and one of the factors to which he attributed the failure observed was that "the wrong kind of person was often allowed to frame the educational policy", and so he went on to intimate that the best method of creating a school of chemistry is to follow the advice of the late Sir William Fowler with regard to the

* Trans. Chem. Soc., 1907, Vol. XCI, p. 637.

establishment of a museum: "First find a curator and let him build his museum around him". A precept like this is capable of application in other ways, and Professor Meldola considered that if it had been more generally adopted the result would have been that the institutions concerned would have filled a more important part in the development of chemical science and chemical industry in England.*

Next let me quote some testimony from the United States of America, where the agricultural colleges had at one time been charged with investigational functions:—

> The investigation branch is now represented by the experiment station, and already the feeling seems to prevail in many colleges that investigation will be practically confined to the station. . . . It is a noticeable fact that comparatively few members of the college faculties who are free from station affiliations are giving much individual attention to research. . . . If we seek the explanation of this paucity of investigation we are confronted first with the unusually heavy teaching duties required in the agricultural colleges.†

But this is not all, for while there is complaint that investigation has been diverted from the colleges to the experiment stations, there is also complaint that at the latter institutions it has been allowed to be dissipated by the distracting work of making compilations of information from various and usually indeterminate sources. More than half of these are described as brief circulars whose relation to experimental work is quite remote. And so it is said that

> One serious feature of this habit of issuing compilations which our stations have acquired is the great amount of time and energy thus diverted from experimental work. In this way not only is the amount of experimental work greatly diminished, but the enthusiasm of the worker for experimental effort is often impaired. When once the easy path to public favour through the compiled bulletin has been trod, it seems difficult for many men to pin themselves down again to painstaking and serious investigation of new problems.‡

Both Professors Meldola and Kipping had contrasted the position of chemical research in England unfavourably with its condition in Germany, and they are by no means isolated in this respect. Professor Edgeworth David, F.R.S., when President of the Australasian Association for the Advancement of Science in 1904, took up the same thread and carried it a step further. He said:—

> The cry that Great Britain in matters of scientific education is behind Germany and America, and that we in Australia are behind Great Britain, has been taken up in Victoria in the excellent report on technical education lately furnished, as well as in the fine report on primary education of the New South Wales Education Commissioners published a few weeks ago. That Great Britain is behind Germany is freely admitted by standard British publications.§

And then he proceeded to show that while Great Britain is behind Germany she is ahead of Australasia. And what of ourselves? I do not think that any one who has given the subject serious and impartial consideration can do otherwise than freely admit that South Africa is in this respect a long distance behind Australia, and it is to be feared that the great reason why, under the old order of things, the Provinces which now make up the South African Union have not made further progress—have, in fact, scarce made any advance at all—in chemical research has been because in so large a part of the country there prevailed what Sir Norman Lockyer once called "the hope of muddling through". We cannot be too certain that such a hope is doomed to disappointment, and that the only sure way to a satisfactory issue is by a definite renunciation of the policy of drift

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* *Ibid.*, p. 642. † Exp. Stn. Record, Nov., 1910, pp. 504, 505. ‡ Exp. Stn. Record, July, 1911, vol. XXV, pp. 3, 4. § Austral. Assoc. Report, 1904, Dunedin, p. 35.

and by an equally definite organization in which method and system are accorded highest rank. In such an organization *personnel* counts for almost everything, and so Sir William Fowler's advice here too deserves the fullest consideration that we can give it.

Having said thus much on chemical research and investigation in general relation to their progress in other countries, let us, even at the risk of repeating what I have said on former occasions—it is a matter of such immense importance to the country—enter more fully into the discussion of what is meant by such terms as "research", "investigation", or "demonstration". And let me at once say this, that I very much object to the name of research being applied, as it so commonly is, to utterly unworthy operations—operations the multiplication of which under such misleading names can do nothing else than lull the country into the belief that quite an appreciable amount of genuine research work is being performed. I feel very sympathetic towards a remark made by Professor Percy Frankland during the course of his presidential address to the Institute of Chemistry three years ago:—

> I yield to none [said he] in my advocacy of research as an integral part of training in chemistry; but do not let us be misled by an empty phrase, or by mere nomenclature. There is much training in originality of thought and experimental procedure which is not called research at all, and there is much of what is called research that involves no originality in either thought or deed.

In another part of that address Dr. Frankland said that

> the phrase "original research" has become a rhetorical catchword of the same order as "Mesopotamia", and, as in the case of that blessed word, its nature and virtues are generally not further described by the orator, but are left for the imagination of the audience to supply.*

These are words to be well remembered when one hears of institutions being founded for or charged with chemical research. In undeveloped countries and undeveloped institutions there is a constant tendency towards the employment of euphemistic expressions; frogs become magnified into bulls and geese into swans, schools are often spoken of as colleges and colleges as universities. Is it surprising that under such circumstances some petty demonstration exercises not deserving even the important name of "investigation" are invested with the still more highly sounding title of "research"? The Secretary for Agriculture of the United States, in his annual report for 1910 (p. 133), said:—

> Legislatures, governing boards, and the public generally will do well to draw a clearer line between experimental and demonstration work.

The reprehensible practice of euphemism in these matters is to be found fast settling down upon this Union. To contest against the continuance thereof is vastly different from opposing genuine research. We should steadfastly and absolutely decline to juggle with names as mere catchwords. Let us not be carried off our feet by the blandishment of empty phrases which do not carry the reality with them. We need to look at such things in a common-sense, matter-of-fact way. Not that it matters in essence what a thing is *called*, for its value is independent of its *name*, but when a jeweller stocks his show cases with quartz crystals and cut glass and advertises that he is selling *diamonds* at absurdly low prices, he may attract a large crowd in the first instance, but it will not take long for the truth to be discovered, and then he will be counted either a fool or a knave.

* Proc. Inst. of Chem., 1909, pt. ii, pp. 14, 15.

But can we imagine circumstances under which it would be perfectly pardonable to be averse to undertaking even genuine research? Unquestionably! Precisely the kind of aversion that the Israelitish brickmaker must have felt when the instructions contained in Exodus v, 18, reached him. The straw needed by the chemical brickmaker is multiform; reasonable laboratory equipment, adequate *personnel*, sufficiency of funds; without these, private, university, and government laboratories alike would scarcely make themselves responsible for the execution of any research work whatever. May I just pause to draw your attention to the fact that the United States Congress voted no less a sum than £280,000 for the expenses of the Bureaux of Chemistry and Soils of the Department of Agriculture during the financial year 1910-11, or exactly one-twelfth of the amount voted for the service of the entire United States Department of Agriculture.

Suppose every desire to have been met in respect of equipment, *personnel*, and financial resources, there still remain other contingent circumstances which must inevitably enter into consideration. To put an extreme case, it would be manifestly incongruous to embark in a Capetown laboratory on an investigation into the deterioration of the pineapple crops at Bathurst; or at Pretoria into improved methods of sugar production and cane cultivation on the Natal coast belt; or in Durban into the relative nutritive values of the cereals grown in the different grain districts abutting on the Cape Peninsula. Matters such as these have to be examined into *in situ*, and to attempt anything different is to force the unnatural. Hosts of instances might be multiplied; they all come to this, that research or investigation must be allowed local ramifications if it is to accomplish any real good, if it be trammelled and pot-bound as to its roots we may be sure that the growth above ground will be dwarfed and stunted. You may supply your head gardener with the very choicest chrysanthemum seed or cuttings, and instruct him to grow therefrom such plants as shall be worthy of a prize at one of our flower shows, but if you stint him in regard to such things as water or pot capacity it will not argue either unfitness or disinclination to grow chrysanthemums if under such circumstances he decline the responsibility of producing such flowers as you desire, and, indeed, to hold him responsible for non-success under such limitations would be to deal most unfairly with his reputation.

But what if there be no restrictions or limitations such as these? Does that fact imply that the field is open to unhindered research in all branches of chemistry? Clearly not. For instance, research in pure chemistry is effectually blocked by reason of the immense gulf separating the equipment and facilities of the best South African institutions from those of the laboratories of Europe, and so enormous are the disadvantages under which we have to compete with the latter that it becomes quite illusory to hope for anything systematic until at least the proposed South African Teaching University materializes. Hence any one wishing to engage in research in pure chemistry will, as a matter of course, carry on his work in Europe. Here we stand on a level with the position in medical research. For the present research in connection with surgery and human diseases generally is incomparably better performed in the older countries than here, and the most that can be expected of us in this direction

is that we give our attention to what is localized in South Africa—sleeping sickness, for example. With the diseases of animals it is vastly different; there we have a field of operation amongst manifold diseases of specifically local types, and accordingly research with regard to them must likewise of necessity be local.

And so I come to this point, that even chemical research must needs take on a local colouring, and it must also conform to the times that are current. While it remains perfectly true—and we cannot over-emphasize it—that scientific research should not be hide-bound by a short-sighted utilitarianism, yet it must be admitted that the trend that such research takes is invariably suggested by contingent circumstances—circumstances of time and circumstances of place. For the most obvious of reasons it never occurred to Cavendish to investigate the properties of helium, nor to Clerk Maxwell, brilliant physicist though he was, to experiment with the X-rays. The circumstances of their own time suggested to these scientists the direction of their investigations. And so also local circumstances are similarly suggestive. England is a manufacturing country, and if we read such addresses as those of Professor Meldola and Professor Kipping, from which I have quoted, we see at once that when they deplore the lack of research, the aspect of applied chemistry that continually shines through their words is that which bears on chemical technology as revealed in manufacturing industries.

Now what is the situation in South Africa? We have briefly glanced at it in its relation to pure chemistry, but as far as concerns the applied science, does any one hesitate for a moment in deciding whither the indications of local colouring point? But just for a few moments consider chemistry in its widest sense. To inorganic chemistry my previously expressed view applies that any attempt to inaugurate definite and systematic research would be hopeless. For the reasons already stated we may concede that to be the function rather of the European and American laboratories, while we have nothing more to do, as a rule, than to accept the results worked out for us there. In the main those results will be attained there with incomparably less labour and expenditure of time and resources, so that while the research worker here would still be trudging along in uncertainty, his fellow investigator overseas would again and again achieve priority almost as a foregone conclusion. To this, however, there is a clear exception; in regard to the chemistry of gold production South Africa is, *par excellence*, one of the foremost places in the world for the prosecution of research, and in that one corner of chemical research the South African investigator may not unreasonably expect to hold the field. We can easily conceive of other such cases arising. If, for instance, those sanguine expectations of a few years ago regarding fabulous amounts of platinum in the Bathurst district had proved well founded, there is no question but that, with a wealth of this metal far exceeding all occurrences thereof in other parts of the world, the centre of research into the metallurgy and properties of metals of the platinum group would instantly have shifted to this country. It was recently announced that radio-active minerals had been discovered to exist in Australia in quantities altogether outstripping anything of that nature in all the world beside. Presuming that report to be confirmed, and supposing that the discoveries said to have been made in Australia had been made

in South Africa, it would be almost inevitable that a centre of research in connection with radium and similar metals would, ere long, be established in this part of the world. But we do not live in dreamland, and the common-sense position is that the chemistry of gold as a subject for research is best left to the laboratories of the mining companies on the Witwatersrand, while for other phases of inorganic chemical research, whatever may be done by the aid of private munificence in the near or remote future, the time is not yet mature for the Government of South Africa to establish any such research laboratories in any part of the Union. If so established I do not doubt but that good results will flow from them, but, as we are now situated, it cannot be expected that the promise of success will sufficiently justify the expenditure on initiation and maintenance.

The mining industry of the Rand is, as we know, concerned with more than merely gold and its metallurgy. There are, as it were, side lines on some of which chemistry has a predominant bearing, and these side lines are constituted on a scale proportionate to the size of the main industry. In this connection we find the manufacture, control, and use of explosives, and such questions as efficient mine ventilation. There, too, we find scope for true chemical research, and, as an outcome of this, Dr. Moir, of the Mines Department at Johannesburg, has busied himself with the preparation of some new organic compounds.*

But, on the whole, even organic chemistry does not afford much opportunity for practical inquiry in South Africa, except where it emanates from or overlaps the chemistry of agriculture, and so it is to agricultural chemistry that we are again constrained to turn. The moment that we thus turn we find ourselves once more faced by the question: what is meant by research, and what by investigation in connection with chemistry as applied to agriculture? Now I want to be as explicit as possibility permits, for even chemists are most unaccountably hazy in their notions just here. Is the distinction really of much practical consequence, I fancy I hear some one ask? To be sure it is. Why it is will be explained in a few moments.

Investigation sets itself to ascertain *what* the facts are; research to discover *why* they are. If we keep these two phases of inquiry clear in our minds, and if all who have to do with the government of the country and with the direction of its agriculture into proper lines of organization will keep these phases and the words which denote them clear in their minds, we shall be saved from much trouble and confusion. When we have settled for ourselves that investigation answers the question "what?" and research the question "why?" we at once begin to perceive order where confusion reigned before, for, undoubtedly, "what?" must precede "why?" since we must know *what* the circumstances are before we can think of asking *why* they are, and so point after point appears in which investigation must needs precede research. At the same time it by no means follows that research into one subject may not go before the investigation of another; in fact, at times this is absolutely essential.

Just here two observations are needed. It follows from what has just been said that investigation is often more mechanical, more commonplace, more routine, perhaps less exciting, than research.

* Report S.A. Assoc. for the Adv. of Science, vol. VIII, Bulawayo, 1911, pp. 253-261.

The latter is the higher class of work and demands the higher brain-power. It betokens an utter incapacity to balance the nature and importance of research if any one thinks that any inexperienced and youthful chemist can be turned loose into a laboratory to do research work just as a cow is turned into a meadow to graze. But if research is the higher work we should not delude ourselves into thinking that money spent on investigation is money spent on research. Incidentally, we asked just now whether it really mattered whether one spoke of a series of operations as investigation or as research; here is one answer. We may establish so-called research laboratories and devote funds to their equipment and maintenance under the impression that we are spending them on research, when all the while their scope and destination is of a distinctly lower order—perhaps not even attaining to the height of what may legitimately be termed "investigation", and, it may be, only of the order of pure *demonstrations*. If we get astray with the idea that we are doing all this for *research*, and then compare with this what some other countries are doing for ostensibly similar objects in the way of erecting, equipping, and maintaining research institutions, we shall be running the risk of imagining that we are making fair progress, and so we shall be content with the prospect of the laurels that we fancy we are gaining and wholly innocent of the fact that we are being left far behind in the race. For this reason, desirous as I am of seeing the Union of South Africa take the place to which it is undoubtedly entitled amongst the countries of the world, it is my fervent hope that things may be appraised at their true value, and that displays of cut flowers loosely planted in the ground—no matter how striking or brilliant—may not be mistaken for a real flower garden. So let us do all that we can to encourage clear and definite thought on these subjects.

Another term that is constantly misused is the word "experiment". One is sometimes asked to give a popular lecture accompanied by chemical "experiments". Strictly speaking, these are not experiments; they are merely *exercises* intended to *demonstrate* certain chemical truths to the audience; an experiment is something totally different, it is a question put to nature by the experimenter, who is not always sure what the answer will be, whereas in demonstration exercises the lecturer or demonstrator is always sure of the result. Demonstrations have their value—and an immense value it is—for instance at an *agricultural school*; but when an *experiment station* confines its practical work to demonstration exercises it is not true to its name. Only last year the Experiment Station Record of the United States Department of Agriculture took exception to this misapplication of the term "experiment" in the following words:—

> The term "experiments" is used in that loose and unfortunate meaning as applied to the demonstrations or trials of well-known facts and principles by school children. The bad effects of such terminology is widely seen, even in our higher institutions of learning, and among experiment station men. It seems difficult under such conditions to establish correct standards for real experimental work.*

Reverting to the distinction between investigation and research, and confining ourselves now wholly to the agricultural aspect of chemistry, it follows from my earlier remarks not merely that investigation must precede research in order of time, but that it is

* Exp. Stn. Record, July, 1911, p. 3.

absolutely fundamental to research in the same way that the foundation of a building is essential to the superstructure that rests upon it. We cannot contemplate with serenity the possibility of this country busying itself in balancing Mahomets' coffins and in building aerial castles. Sober-minded reasoning demands that we should proceed with our foundations with all speed—the foundations of investigation —if we wish to erect a stable structure of research thereon. It is just at this corner that we meet the vendor of cut flowers. And so we go back to the primal question: What is this investigation of which we speak?

To collect and collate the chemical facts with regard to agriculture in the Union of South Africa should be the very first task of the agricultural chemist. For this the first essential is constant, close, and friendly consultation and co-operation with the country's most experienced farmers. The farmer, speaking in a collective sense, is a veritable cyclopædia of information for the agricultural scientific investigator. There may be mutual contradictions and discrepancies between the various informants, but, after sifting and arranging all the information received, it will often be found that local conditions explain away apparent contradictions, and that a consensus of information can be sorted out as a preliminary basis for investigation —a consensus of information that has undoubtedly been founded on actual definite observation and practical experience. Such a result of collected experience is crystallized in the adage, "Lime makes rich fathers but poor sons". In our own country we may find crystallized ideas like that by the hundred, although not always so tersely expressed. It is the work of the investigator in a new country to collect these ripe opinions, to test their accuracy as far as he is able, and then to ascertain, either as he goes along or subsequently, their fundamental and causal principles.

But of course the investigator needs to do far more than merely depend upon the farmer for the collation of his facts. If he stopped short with these there would be no investigation at all. Let me indicate my meaning by referring to the subject of an agricultural soil survey. We are not put in the way of getting all the information we want merely by sending men all over the country to collect typical samples of soil for examination, and to converse with the agriculturists of each district regarding the local soil types. More than this is wanted. There is one phase of the investigation which is perhaps more important than any other, and the investigator gets into touch with it through the soil samples which farmers, quite of their own accord, send to the soil chemist for his opinion and advice. It is important for the same reason that "walking the hospitals" is of importance to the medical student. When a farmer submits a soil for examination it is almost invariably because he has experienced some difficulty in connection with it, and the place to which such samples are sent becomes a veritable soil hospital in the sense that it is a place where experience in the treatment of sick soils is far sooner acquired than by the examination of many hundreds of good soils that stand in no need of treatment. Now, as soil investigation is carried on essentially for the purpose of improving the productiveness of inferior soils, and, as the mere examination of unproductive soils received from farmers is often far from sufficient in itself—that is to say, without comparison with standard productive soils—to

afford any clue as to the proper mode of overcoming the difficulty experienced, it stands to reason that the body of men who are acquiring experience in regard to the standard productive soils and the general soil types of the country is also the body that will be in the best position to note any divergences from those types or standards which any unproductive soils may exhibit; hence we shall not help but hinder the amelioration of general soil conditions if the farmer be made to send his *sick* soil to one institution while another institution, working in perfect independence of the former and without any knowledge of the information that is being gained there, sets itself to examine the *healthy* soil types of the several districts. To attain the best results, therefore, all the wires should, so to speak, converge to one hand, and it as great a mistake to consider the examination of unproductive soils submitted by farmers as "mere routine", and therefore to be ranked lower than investigation, as it is to call investigation itself "research" and then to accord it a higher place than it merits.

As a matter of fact you cannot advise at all on the subject of any unproductive soil until you have first by investigation established your standard for a normal healthy soil, or, to quote Hall and Russell, of Rothamsted:—*

> The analysis of a single sample of soil casually sent in by a farmer cannot be properly interpreted unless the analyst possesses an adequate knowledge of the *type*.

All of this means that there must be co-ordination. The soils must be co-ordinated, each to its type; our interpretations of the facts which we observe in those soils must be co-ordinated to each other, and co-ordination must go even further than that. Without co-ordination the essential uniformity of analytical method will be lacking. Professor Hilgard, in his classic book on "Soils", says, with regard to Wohltmann's investigation of the soils of Samoa—

> the analyses are quite numerous, but, unfortunately, are made by a special method which renders them only partly comparable with those of any other analyst;

and with regard to 500 Madagascar soils analysed by Muntz and Rousseaux he observes:—

> So large a number of analyses should give a very full understanding of the agricultural capacity and adaptation of so comparatively limited an area; unfortunately we are here again confronted by more or less imperfect data, and by the use of an analytical method different from those of all other nations, and hence incommensurable

Hilgard regrets to find this kind of incommensurability existing between nation and nation, but it would be deplorable if lack of co-ordination should lead to its continuance in the least degree within the borders of the South African Union between Province and Province, as it at present unfortunately exists, and so spoil much of the solidarity and continuity of the investigational work with regard to soils carried on within these borders.

We know that, as an industrial science, chemistry never operates in isolation. When we concern ourselves with the chemistry of the country's vegetable products it is the science of botany that has to afford additional aid; if it is general agriculture that we are dealing with, the chemist may also have to work in co-operation with the zoologist, entomologist, or mycologist. Often, in connection with investigation of the country's mineral products and of its agricultural

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* "Soil Surveys and Soil Analyses", Jour. of Agr. Science, vol. IV, p. 223.

soils, consultation with the geologist is required. In any case there is this one outstanding fact that these various scientific offices need to be in closest touch with each other in order to promote the smoothest working of the entire machine of investigation as an organic whole.

This close contact between science and science is of great importance, but it is still more important that contact between the various workers *in one and the same science* should be as intimate as proper co-ordination and organization can make it. During its annual convention towards the close of 1910, the American Society of Agronomy was very largely occupied with the standardizing of methods for conducting experiments. It was then shown, again and again, that a large amount of experimental work done in the United States had led to results which could not be compared with each other, were difficult to interpret in a reliable way, and were liable to lead to wrong conclusions because there had been no agreement as to method amongst the various institutions involved in the work. We do not wish to have these mistakes repeated in South Africa; our desire is rather to profit by the experiences of other lands, but unless we look well to our steps we stand to repeat some of those very mistakes in an aggravated form. Therefore, lest we should go on a wrong track with regard to this matter of investigation and research, two principles should remain deeply graven on our minds: these are co-ordination of effort and unity of plan. Every stone in the Great Pyramid is co-ordinated to all the rest; each one has its special place in the design, and those which form the foundation are far from being the least important.

But while avoiding what other countries themselves have recognized as their mistakes, common sense makes clear to us many a good point which could well be adapted to our own circumstances. And so more than one useful lesson may be learnt from the Annual Report of the United States Secretary of Agriculture for 1908, where, with excusable satisfaction, he thus reviews the previous twelve years' work of his department in agricultural chemistry:—*

> At the beginning of the period under review the work of the Department in agricultural chemistry was confined to an analysis of soils, fertilizers, dairy products, and cereals, and to sugar beet investigations: at the close of the period there is not an industry nor an activity bearing upon the welfare of the farmer that is not studied chemically, whether he be considered as producer or consumer. Only a few of the particulars can be mentioned, and these briefly. The manufacture of syrup from cane sugar has been studied, including the fertilization of the plant, improved methods of manufacture, and the chemical control of the factory operations, with a view to producing a profitable merchantable product. In connection with this the suppression of sophisticated products and the proper labelling of substitutes are seen to be of very great agricultural importance in fostering the production of legitimate syrup.

Now, here we see the way in which the United States makes the suppression of sophisticated products to contribute to the building up of the country's agricultural industries by being controlled in the very department whose one function it is to build up the country's agriculture. It was on the same basis that the last two Governments of the Cape Colony began building when they successively carried through Parliament measures controlling the manufacture and sale of such articles as wine, brandy, liqueur, whisky, beer, vinegar, fertilizers, farm foods, and pest remedies, and laid down precise definitions of all these articles. Had the progress of this system of

* Pp. 168, 169.

legislation not been interrupted by the weightier matters of Union, it would long ere this have been extended to cover such articles as butter, cheese, jam, and probably others for which legislation had actually been initiated, so that what seems at a superficial glance barely more than police work is thus made to be of direct encouragement to productive local agricultural industries and to protect the latter against the competition of cheap inferior imported articles.

The review of the twelve years' work of the United States Bureau of Chemistry continues thus:—

Environment studies based on the chemical examination of products grown in different parts of the United States under close supervision have afforded valuable information as to the effect of variations in temperature and rainfall on the sugar content of beets and Indian corn, and the protein content of wheat. A chemical study of the composition and effect of insecticides and fungicides, the establishment of the futility or even harmfulness of some of them, and of the loss to the farmer resulting from false claims made on the labels of such products have led to a movement for national legislation on this subject, many of the States having already enacted laws governing the sale of such products. The problems of soil analysis and fertilization have been attacked along the most painstaking and conservative lines, involving extensive pot experiments, and the comparison of various methods of soil and plant analysis to determine the specific fertilizing needs of a given soil for a stated crop. The simple consideration of the determination of potash, nitrogen, and phosphoric acid in the soil has given way to the most complex studies of all soil constituents, both organized and unorganized. Microchemistry and bacteriological chemistry have come to the aid of the soil and the food chemist especially, and play a conspicuous part in solving the problems and meeting the emergencies which confront the practical chemist of to-day. Physiological chemistry has become an essential factor in the work, especially in the determination of injuriousness of preservatives or colouring matters added to foods and the specific action of certain drug products.

The far-sighted wisdom of the men at the head of the United States Government has discerned two important principles, namely, (1) that all its chemical work of research or investigational nature must have its outflow from agriculture, and (2) that towards agriculture all other chemical work can be made to converge; and so they have directly associated the great organization of their Bureau of Chemistry with their Agricultural Department, and it has ever been and ever shall be my personal conviction that if we are to achieve even a comparable amount of success we shall have to do likewise. See the wisdom of such a step exemplified. Starting with the utilization of agricultural wastes, the Bureau of Chemistry has, in the Denatured Alcohol Act, opened up possibilities for the supply of cheaper industrial alcohol as an easy source of light, heat, and motive power, to commerce in general, and even to the farmer himself. That is an instance of what I may call chemistry diverging from agriculture to the benefit of other industries. As an example of chemistry convergent on agriculture may be mentioned the studies of wastes from factories and smelters with a view to turning these wastes to commercial account. The agricultural bearing of this lies herein that the restriction of these wastes is to the direct advantage of trees, crops, and stock.

I say the United States authorities demonstrate their wisdom by making their agricultural chemists practically omnivorous; they set them extensively to investigate paints and varnishes, on the one hand, and to control adulterated foodstuffs on the other, and people ask in surprise what support either of these wings of the Chemical Bureau can find in the agricultural atmosphere. Now, the paint investigations have led the American farmers to concern themselves directly in systematic production of flax seed for the manufacture of

linseed oil, and, as for the food adulteration work, Mr. Secretary Wilson remarks:—

Should this seem a far cry from the progress of agricultural chemistry, it must be remembered that the repression of sophistication means the increased demand for the best and purest products . . . and without the progress which has been made in agricultural chemistry, the need of the food law would hardly have been discovered, and the public opinion necessary for its passage could not have been aroused, nor could its provisions have been executed after its passage. That foods should be wholesome and what they are represented to be . . . that drug products of known quality should be available for the use of the physician, and that injurious, or, at best, worthless preparations should not be foisted upon the people without their knowledge, are among the services rendered to the community by agricultural chemistry in the broad sense in which the enlightened policy of the past decade has interpreted it.

It is in precisely this "broad sense" that I hope to see agricultural chemistry interpreted in South Africa. You will agree with me that Dr. Wiley and his chemical colleagues in the United States have given an excellent account of their stewardship during the past decade. I have no shadow of hesitation in asserting that in the coming decade, under a similarly enlightened interpretation, the chemists of South Africa would render an equally satisfactory account, and I feel all the more sure of this because I know what my own colleagues in the Cape laboratories have done during the last score of years; but to that I have referred elsewhere.* South Africa has had a late start in many respects, but in the matter of agricultural chemical investigation she is more contemporaneous with the older nations than in other scientific beginnings. Less than two months ago a prominent educationist, Mr. H. A. Roberts, M.A., Secretary of the University of Cambridge Appointments Board, showed how recent the development of intimate relations between agriculture and chemical investigation really is. In an address to the Royal Society of Arts he said:—

Agriculture has just awakened to the fact that the scientifically trained man can be of the greatest use. Until twenty years or so ago, the only science which had really established any definite claim to assist agriculture was chemistry. Even then every country, every colony, every agricultural society had its trained chemist. But in those days the chemist largely confined his attention to analysing manures, foods, and other agricultural commodities. All this is now changed. There are still analysts who perform the invaluable function of controlling the sale of fertilizers and feeding stuffs, but agriculture is nowadays employing scientific chemists to investigate such subjects as the problems of soil fertility and the growth of crops, and the laws of nutrition of animals.†

And now I must conclude. The one serious danger that the country has to face in connection with chemical investigation and research is the "cut flowers" fancy to which allusion was made some minutes ago. It is not only a far more serious danger than most people imagine, but it is neither a distant nor a mythical bogey. It is a veritable old man of the sea, close at hand even to immediate contact, clawing on to one, capable of doing an immense amount of mischief, and meanwhile thriving on sensationalism and advertisement. Chemical research must be content to move onward without popular applause. True, one never knows when the most stirring results may come from its efforts, but then again no such results may be apparent for very many years. So, on the one hand, if fettered and bound by popular ideas of what it ought to be, it is not chemical research at all, and he who declines to undertake a caricature must

* Report S.A. Assoc. for Adv. of Science, Bulawayo, 1911, pp. 92–114.

† Journ. Roy. Soc. of Arts, 1st March, 1912, pp. 431, 432.

not be blamed if he refuses to be misled by the false label. On the other hand, if left untrammelled, it cannot be expected to pay its way in a direct commercial sense, and hence it needs very heavy endowment; the chemist must be in the pure air above the fogs of penury if he is to have freedom for planning and performing research, but give him this freedom and you do not know what unanticipated discoveries may result. Had no Columbus ever set sail, America would never have been known. Not having been discovered, it would not have been missed, but we know, nevertheless, that the world would have been unspeakably the poorer. We cannot know, until research lays its trophies at our feet, what we would have lacked if research had been restrained, so let us beware of girding at chemical investigation because of its apparent aimlessness. Mr. Roberts concluded his address the other day in the following words, speaking particularly of bio-chemistry:—

> It is a science which lies at the root of the problem of plant and animal disease, plant and animal nutrition, and so is fundamental to medicine, to agriculture, to stock breeders, and to the feeding of the classes who have not sufficient means to secure a "mixed diet". And in all these directions there are problems of the first magnitude awaiting solution. Yet the amount of research done in England has been very much less than it should have been, simply because the difficulty of the immediate steps in research has been realized, and there has not been a sufficient livelihood or equipment for those who were known to be fitted to overcome those difficulties. It is not by direct means only that science can serve industry.

Again I ask: How is it with South Africa? Nowhere on the face of the earth is there a grander field for chemical investigation! Never in the history of this land was there a more opportune time to begin it! I confess to feeling somewhat discouraged at what I have seen, and therefore with all the more earnestness I ask: Are we going to plant that field with cut flowers? Are we going to fritter away that opportunity? The next few years will show what the answer has been.

Temperature Treatment of Wine.

By Professor P. D. Hahn, M.A., Ph.D.

(Read at a meeting of the Cape Chemical Society on 1st March, 1912.)

I propose in this paper to give the results of certain experiments which I carried on last year with regard to the action which a reduction of temperature has on fully matured light white wines. But since the temperature at which grape juice ferments has also a great influence on the quality of the wine produced, I shall first briefly refer to the temperature of fermentation and then explain the experiments and the result of these experiments which I obtained by the temperature treatment of a matured wine.

It is well known that the progress of fermentation of grape juice is principally dependent upon the temperature at which fermentation takes place. On examining the temperature at which the yeast manifests its vital functions, we find that there is a minimum temperature at which it does not act at all, an optimum temperature at which it is most active, and a maximum temperature at which the vitality of the yeast is completely destroyed. Yeast is capable of resisting low temperatures very well without losing its vitality. At 0° C., yeast is merely in a dormant state, and when frozen in ice and kept there for weeks it will be found on melting the ice that the yeast is alive and active and will start fermentation at once when introduced into a suitable solution of glycose, previously sterilized, provided this solution is at a temperature of 12° C. to 15° C. At this temperature (12° C. to 15° C.) the fermentation proceeds only slowly, but it becomes more and more active as the temperature is raised and reaches 30° C. to 35° C. This range of temperature is the optimum temperature of fermentation. If the temperature of fermentation be still further raised, we observe that the intensity of fermentation rapidly decreases, and, at 40° C., it comes to an end altogether. In fact, at a temperature between 50° C. and 60° C. the vitality of yeast is completely destroyed. On keeping a wine for half an hour at 65° C. the life of the yeast becomes extinct and it cannot be revived again. Upon the latter facts is based the process of pasteurizing. This process should be carried out in two stages: the first serves to coagulate the albuminous constituents of the wine, while the object of the second heating is the complete annihilation of the life of the yeast.

The temperature between 30° C. and 35° C. is called the optimum temperature for fermentation, but if we allow grape juice to undergo fermentation at this optimum temperature the wine loses enormously in bouquet and carbonic dioxide; the resulting wine is flat and insipid. The average highest temperature of the fermenting grape juice on the Rhine and Moselle is 22° C. (about 71.5° F.), but, as a rule, the temperature is 17° C. to 18° C.

All these facts are common knowledge, and unless we pay attention to them we shall never be able to produce a fine wine. I am of opinion that we are still far from making the best wine from our beautiful grapes that could possibly be made if we only attended carefully to the temperature conditions under which grape juice which is to yield light wines should be fermented. However, by trying to keep the fermentation temperature down as much as we can by the primitive means at our disposal and by observing the utmost cleanliness in all our cellar operations, we are now producing light wines which stand comparison with the best wines of the same type produced in other countries under the same conditions. These light wines are completely fermented and by proper manipulation are eventually "candle-bright" and keep well.

Last year some observations were made in connection with these finished wines which induced me to make some experiments. A well prepared and matured wine, Sauvignon Blanc, grown on a rich but light lime soil, had been sent to Johannesburg where it had been stored in a place in which the wine was exposed for some considerable time to as low a temperature as was observed during the winter months in Johannesburg. The wine turned cloudy and turbid and was pronounced unfit for consumption.

I had an opportunity of examining the wine and analysing the substance causing the turbidity. I found that the latter consisted entirely of cream of tartar. It was quite evident that the turbidity had been caused by the cream of tartar, which is naturally contained in the wine becoming insoluble at the low temperature to which the wine had been exposed in the Johannesburg store.

I now proceeded with my experiment. About twenty-four bottles of this wine which had been rejected were filled into suitable Winchester bottles. These were placed in a large tank containing sufficient water to immerse the bottles to the neck. Every day a certain amount of ice was placed in the water of the tank, thus keeping the temperature of the wine at 8° C. to 10° C. The wine was kept at this temperature for five weeks. It was then found that the contents of the bottles were perfectly "candle-bright", but at the bottom of each bottle was a white sediment which was found to consist of pure cream of tartar. The clear wine was then completely syphoned off into clean jars, and was again submitted to the same temperature treatment as before, but this time only for three weeks. Since no trace whatever of deposit was formed, I concluded that so much of the cream of tartar as would be rendered insoluble at a temperature of 8° C. to 10° C. had been removed, and that the wine would now keep. I subsequently placed the jars in direct sunlight, then in cold water, then in warm water, but found that the wine remained perfectly clear and candle-bright.

The wine was analysed after it had undergone temperature treatment, with the following results:—

Total acid	5.75	per mille.
Volatile acid	.36	,,
Alcohol	13.62	volume per cent.
Sulphuric oxide...	.044	per cent.
Potassium sulphate	.095	,,
Lime	.018	,,
Extract	1.976	,,

Ash	.196	per cent.
Cream of tartar...	.290	,,
Succinic acid	.149	,,
Glycerine	.683	,,
Sugar	.123	,,
Malic acid	.871	,,

The amount of cream of tartar in the wine before it was submitted to this treatment was .395 per cent. All other ingredients were the same after as before the treatment.

The results of these experiments confirm the practice of fining and bottling light wines in winter when the temperature of the cellar is at its lowest. If a mature wine could be found and bottled in "cool chambers", there is no doubt that it would remain perfectly bright and clear under all circumstances.

An Early-Maturing Hickory King.

By Joseph Burtt-Davy, F.L.S., Government Agrostologist and Botanist.

For some years I have been endeavouring to produce an early maturing 8-row Hickory King maize to meet the persistent demand of high veld farmers. It is generally recognized that such a mealie would do much to increase the yield of maize on the high veld, because it would lengthen the planting season and reduce the losses from early frosts which at present seriously reduce the crop.

Certain technical difficulties have been met with in this work which have delayed the realization of the results sought, but I am glad to be able to report that at last our efforts have been crowned with success. By selection of early maturing individuals, and by crossing, I have succeeded in producing a vigorous, pure white

Plate IA.

Hickory King (typical 8-row) which, planted in the middle of October, 1911, was dead-ripe and harvested on 15th February, 1912, and was safe from frost at least two weeks earlier. This was in no sense a weakling plant, ripening prematurely, but a tall, robust individual. There was only one plant of it, and this was self-fertilized, so that the task of "fixing" the strain should not take long. The plant came from an ear of Hickory King × Black Mexican, of which most of the grains were black, though of the true Hickory shape; being white (i.e. recessive) they have bred true to colour.

The ear is illustrated on Plate I, and the grain on Plate IA. It carries only about 220 grains, being only about two-thirds covered owing to lack of pollen to complete pollination. The butt is weak, the sulci are too wide, and the grain is a little on the small size even for the high veld, but these defects can be remedied. The great thing is to have secured the early maturing character.

An Early-Maturing Hickory King.

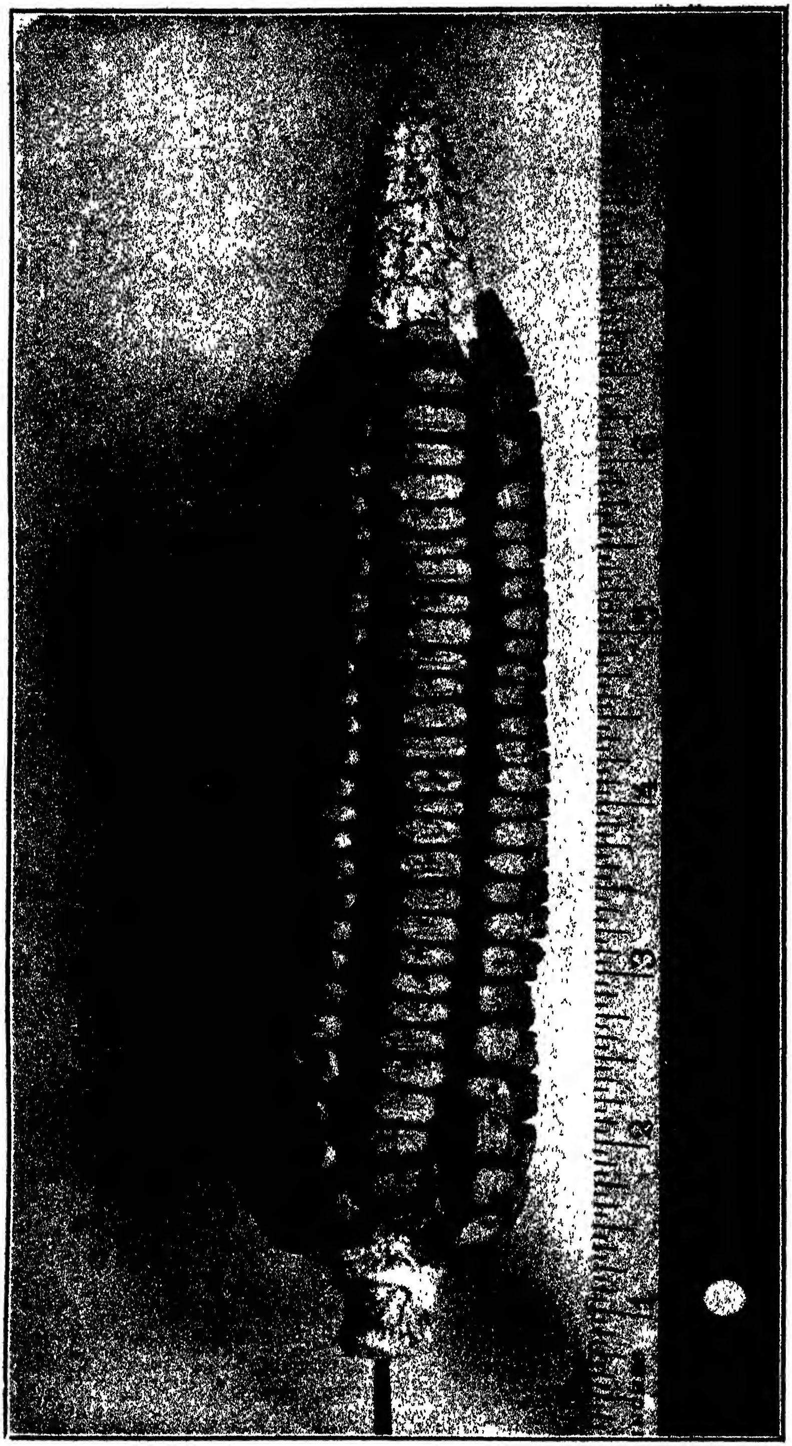


Plate I.

The 220 grains are to be planted next season and the crop studied for possible variations. The progeny must then be planted in 1913, and it will probably be in that year that the tendency to split out into late and early maturing strains will be observed. If this tendency to vary is not too great it may be possible to issue a very limited supply of seed in 1914.

But I wish to warn readers that another season may yet cause the new strain to take longer to mature. No breed of maize takes the same time to grow and ripen every year; early maturity is a relative character and very dependent on the season.

The Agricultural Show Season, 1912.

THE STANDERTON SHOW.

The show at Standerton this year was quite one of the best of the district shows held in the Transvaal. The weather was good, the attendance quite encouraging, and the entries all that could be expected in the circumstances. Some of the sections were filled to overflowing, and the work of the judges consequently far from simple or easy. The great feature of the exhibit was the large number of horses and cattle, but the latter were ahead of the former as regards quality. The strong feature of the horse section was the large number of entries in the "Boer Horse" and miscellaneous classes. These in themselves would constitute a fair show in ordinary circumstances. The Thoroughbreds were few, and there were only a couple of Hackneys, one Clydesdale, three Suffolk Punches, and a few Coach Horses. But what was lacking here was more than made up in the other classes, and the horses made quite a brave array, forming one of the most interesting features of the show. It is very evident that Standerton is not inclined to lose its reputation as a horse-raising centre, and with a little more attention to size and development it should in the near future render great service to the country generally by producing a sound general purpose animal that will make its reputation.

The cattle, both numerically and from the standpoint of quality, were, if anything, a more interesting section than the horses. The show of Afrikanders was very fine, and there were so many of them the first impression left on the mind was that this breed must be favoured to the exclusion of all others in these parts. But that this is not so was shown by the splendid array of Frieslands, Shorthorns, Herefords, Ayrshires, and Devons. Even more interesting than this was the great array of fine cross-bred cattle, these being very strong indeed, and their quality in most cases very high. The milking types in these classes were of a high order of merit, while the beef types were by no means deficient. The Merino sheep were a little disappointing owing to the poor competition. Among the exhibits, however, were some very fine types of Merinos, the largest exhibitors being the well-known Transvaal breeders, Messrs. A. & V. Robertson. A large number of flock sheep were on show in classes specially set aside for them, but it is doubtful what good classes of this description can do for the wool industry. The best and only the best should be shown at these exhibitions, otherwise they are inclined to be misleading. The wool and mohair were very disappointing. Classes for a few fleeces or a few pounds weight of wool or mohair can do no possible good for the industry.

There were some very good pigs on show, these including Yorks, Berks, and Blacks.

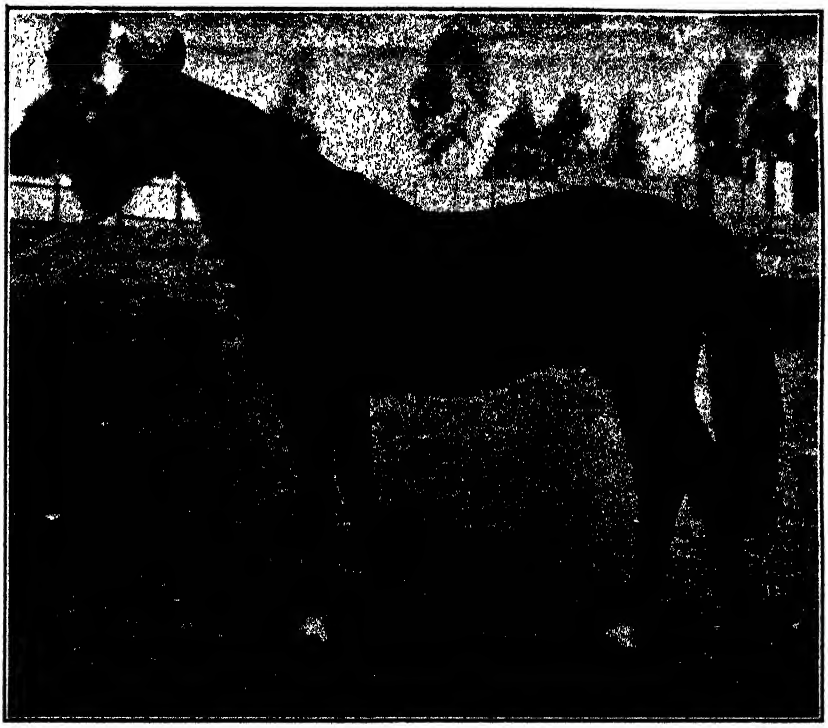


Photo by T. Brittain.]
Sir L. Phillips' Thoroughbred Stallion "Sarcelle." Champion and Challenge Cup, Johannesburg.

Photo by T. Brittain.]
Mr. E. B. Moore's South African Bred Friesland Bull. Winner of Four Firsts.

The poultry brought a large number of entries in most classes and made quite a good show.

Another strong feature was the general produce, which showed up to great advantage.

In fact, taken all round, and when it is considered that the dates clashed with the fixture at Pretoria, the Society is to be congratulated upon having scored a very decided success. Every one interested in the rural industries of this section can but wish them every success in the future. There is one point connected with this show which calls for attention if it is to take its rightful position in the country, and that is the needless extension of the prize-list. Fewer classes and larger prizes should be aimed at. Of course these things cannot be achieved at once. They have to grow. But the time is rapidly advancing when districts like Standerton, with their wonderful potentialities—as evidenced by the last show—must make up their minds to march with the times and invite more outside competition if only to give the local farmers an opportunity of seeing the best that is going.

There was a fair showing of implements and an excellent section for the ladies.

THE WITWATERSRAND SHOW.

The great show at Johannesburg filled the Rand with visitors during the Easter week, and well were they repaid, for it was one of the best attempts ever put forward by this constantly expanding society. The grounds were in excellent order, and everything passed off with eclat. So much has been written about this magnificent exhibition that little is left to add in these pages. We can only say that in horses and cattle it easily surpassed anything yet put forward in this country. The Johannesburg Show seems to be gradually assuming the position of the premier horse show of the country. This is not to be wondered at when the facts are recognized, for it is here and here alone that the breeder of Thoroughbreds can depend upon securing a satisfactory market for the bulk of his wares. That accounts for the magnificent display in the classes devoted to these animals. In the young stock particularly the quality was most marked and promising, while the number of competitors seemed to be legion.

The cattle section was another splendid display, nearly every breed of note in the country being represented. The finest Shorthorn stock in the country was to be seen here, and the same may be said of the Frieslands, Herefords, Ayrshires, and other prominent types. Herewith we give some photographs of the leading prize-winners, so there is little need to enlarge further.

In sheep and goats the show was distinctly weak. It would seem that the show season is getting a little too prolonged for the Merino and Angora breeders. It makes the season so late for animals to be kept with their fleeces on till the end of April that many of the best breeders cannot afford to take the risk with their most valuable stud stock. In fact indications are beginning to point to the necessity for a little regulation of these matters in the interests of the animals themselves. What course may ultimately be adopted it is difficult to say,

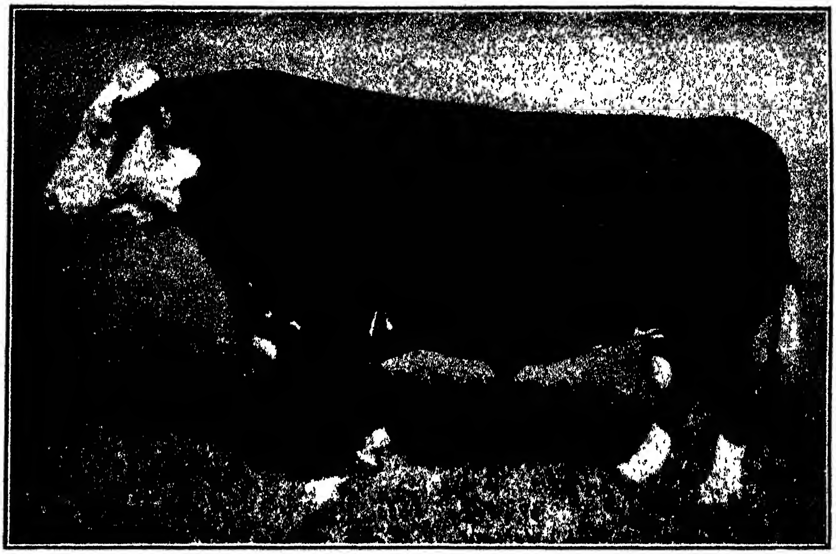


Photo by T. Brittain.]
Hereford Bull, "Noke Gallant." Government Experimental Farm, Potchefstroom. Champion, Johannesburg.

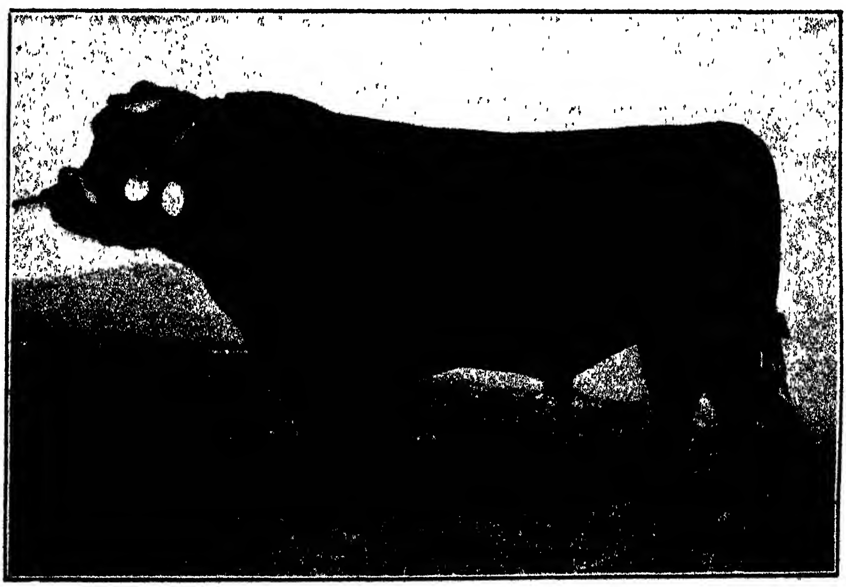


Photo by T. Brittain.]
Sir G. Farrar's Shorthorn Bull. Champion, Johannesburg.

but one way out would be to arrange championship meetings for different classes of stock. This could be done by alloting the leading societies a group of animals each. In other words, the day of a special show for special animals seems to be in view.

The implement section at Johannesburg is improving year by year, and this year was the best and most varied yet seen. There are still many gaps to fill in this section, and in time we hope to see more in the shape of complete exhibits. Such a large and important centre should be in a position to put on a better show of implements than any other part of the country.

MAIZE EXHIBITS AT THE JOHANNESBURG SHOW, 1912.

By JOSEPH BURTT-DAVY, F.L.S., Government Agrostologist and Botanist.

THE maize exhibits at the Johannesburg Show of 1912 were, of course, somewhat wet, owing to the early date at which the show is held. The bulk samples were in some cases not up to standard owing to the very unfavourable season. In the competition for breeding ears, however, especially in the ten-ear classes, the exhibits were far more uniformly high grade than at previous shows. The progress which Transvaal farmers are making in the selection of their seed is highly satisfactory. This may be attributed in part to the adoption of a uniform system of maize judging at the leading shows of the Transvaal, followed by demonstrations to the competitors of the reasons for their successes and failures, which has enabled farmers to work towards a definite ideal through a series of years.

While Messrs. John Fowler & Co. again carried off the bulk of the prizes (two championships, nine firsts, and two seconds) new prize-winners are coming forward and pressing them close for first place; in two instances Messrs. Reynolds Bros., of Val Station, District Standerton, beat them. This is encouraging to other growers. The keenness of competition this year, especially in some classes, was most refreshing, and is an excellent index of progress.

The benefits of persistent aim at a definite ideal in the selection of seed are at last making themselves felt; this was strikingly demonstrated by an exhibit of twelve-row Hickory grown by Messrs. Hutchinson & Shaw, of Val Station, Standerton District. These gentlemen have been selecting their maize ears for improvement of quality and yield for the last three years under my direction. Last year the crop from the second selection showed so little improvement that they were inclined to give up the attempt to improve their old strain and to make a new start with fresh seed. I pointed out to them that it takes three years of continuous selection in one direction to improve the crop, and they were persuaded to continue, with the result that this year, although a bad season for maize, the improvement is most marked, and the gentlemen have expressed themselves as well satisfied with the result. Plate 1 shows an ear of their maize, and one of the grains of the same ear is shown on plate 1A; this grain is ¾ inch long, which is a remarkable length for high veld maize, especially in a season like the present. The ear figured is far from perfect, the rows being irregular and the spaces ("sulci") too wide, while there is an

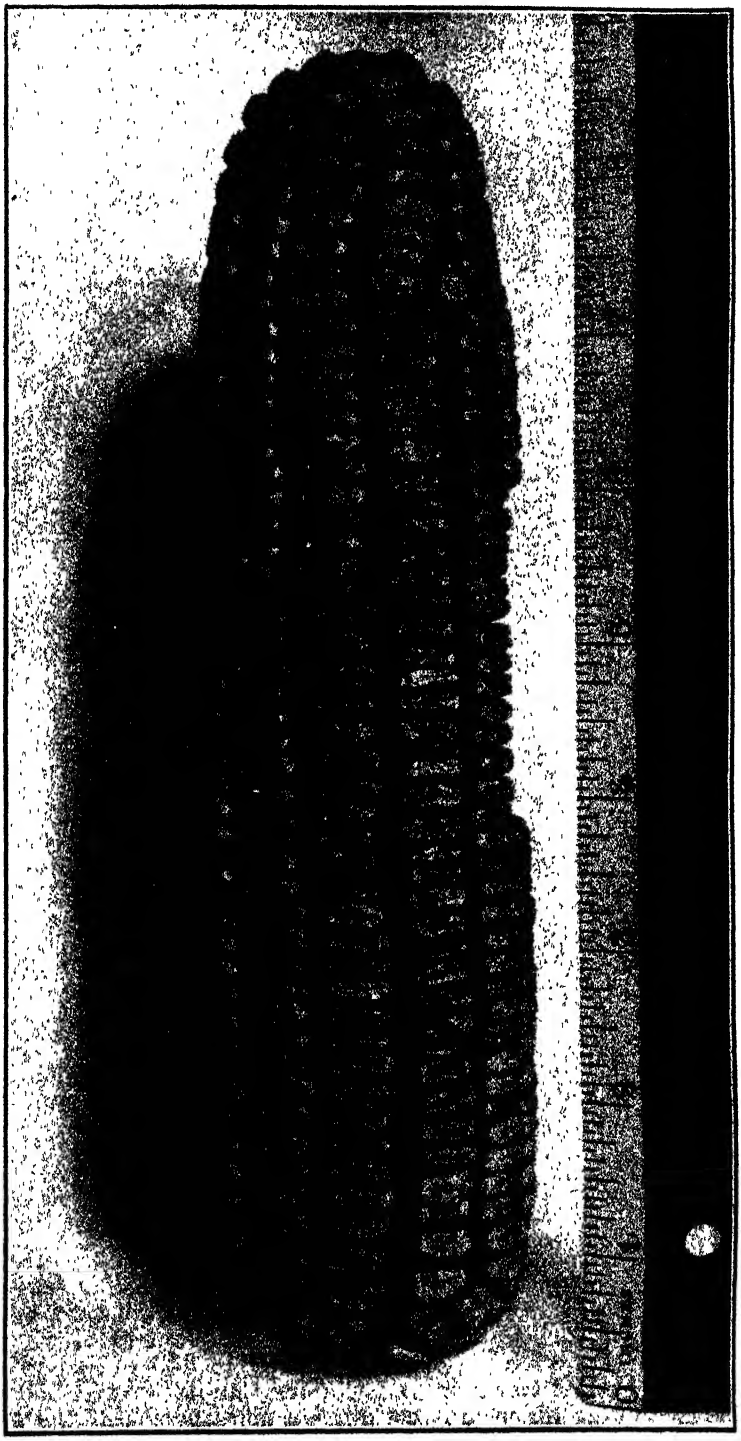


Plate I. Maize Exhibit at the Johannesburg Show.

erratic grain near the tip which spoils the appearance; but it should be remembered that selection was mainly directed towards lengthening the grain and the ear. Now that these points have been gained some attention can be devoted to the sulci and to the straightness of the rows.

The fact that we can never get any one breed of maize to suit all the peculiar climatic conditions of South Africa, nor even of the areas which compose what may be called the South African maize-belt, has been strikingly demonstrated this year. Nor can we expect to find any one breed which will do as well in wet seasons as in dry or vice versa. This year we have very few exhibits of Chester County, and they were generally of very poor quality, whereas Eureka, which in wetter seasons has been but poorly represented at Johannesburg, had more exhibits than usual.

The keenest competition was in the eight, ten, and twelve row Hickory classes. The two last named are coming markedly to the front for high veld conditions, and several exhibitors mentioned that they are giving better yields and proving decidedly earlier than the eight-row type. It is probable that they will be made still earlier by definite and continuous selection in that direction. There was a noticeable improvement this year in the length of ear in these two breeds.

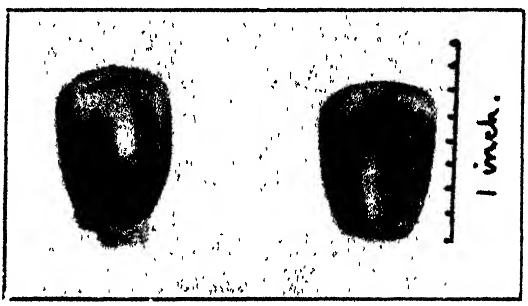


Plate IA.

Much of the Eureka was badly crossed with whites, disqualifying it for competition. If such crossing is accidental it should be eliminated by selection and the use of pure seed; if it has been intentional the cross-bred should be purified of the white admixture.

Of Chester County there were very few exhibits and these generally of poor quality, which is unfortunate, as this breed is growing in favour for feeding purposes owing to the small size of the grain and consequent higher feeding value. Farmers do not yet fully appreciate this fact. Most of the protein and fat of the maize grain are stored in the embryo or "germ", in fact 70 per cent. of the protein is found in the germ and the hull, and only 30 per cent. in the endosperm or starchy matter. The more germ we have to a given bulk of grain the richer it is from a feeding point of view. In the eight-row Hickory King we get from 350 to 450 grains to an ear, while from Iowa Silvermine and Chester County we get 800 to 1100 grains. Weight for weight we get far more grains of the two last-named breeds than of the eight-row Hickory, and therefore more germ and higher feeding value.

Photo by T. Brittain.]
Ayrshire Cow. Government Experimental Farm, Potchefstroom. Champion, Johannesburg.

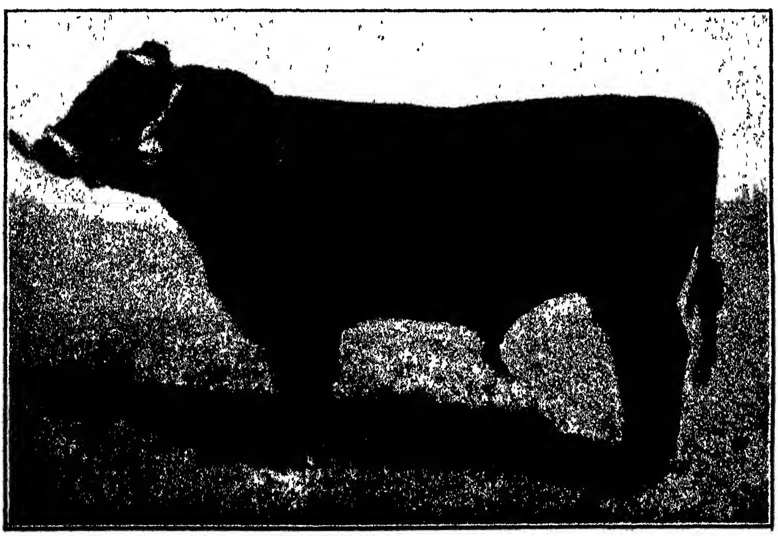


Photo by T. Brittain.]
Mr. J. F. Nothling's Shorthorn Bull. Winner Three Firsts, Johannesburg.

The following is an annotated report on the several exhibits:—

SECTION A.—BEST MUID OF SHELLED MAIZE.

Class 373.—Hickory King. Seven entries. The grain exhibits were not quite up to the standard of some years. Seven entries, only five exhibits.

First and Championship of Section.—No. 1753. John Fowler & Co., Vereeniging, Heidelberg District.

Second.—No. 1752. Reynolds Bros., Val Station, District Standerton. Moisture, 20.2 per cent.

Third.—No. 1751. John Stiell, Kinross, District Standerton.

Due allowance was made for wetness of sample.

Class 374.—Louisiana and Hickory Horsetooth. Five entries.

First.—No. 1757. Reynolds Bros., Val Station, District Standerton.

Second.—No. 1758. John Fowler & Co., Vereeniging, District Heidelberg.

Third.—No. 1755. J. Stiell, Kinross, District Standerton.

Class 375.—Virginia Horsetooth or North American. One entry.

First.—No 1759. J. Fowler & Co., Vereeniging, District Heidelberg.

An excellent sample, dry (moisture, 11.6 per cent.), of good quality and colour; grain rather loose on the ear, but the ears otherwise of excellent quality.

Class 376.—Natal White Horsetooth. No entries, probably on account of the late maturing habit of this breed.

Class 377.—Iowa Silvermine. One entry.

First.—No. 1760. J. Fowler & Co., Vereeniging, District Heidelberg.

This exhibit departs somewhat from the old Iowa type, but is of outstanding merit; ears well filled and of excellent quality; grain dry (moisture, 13.8 per cent.), of good quality and colour, and beautifully firm on the ears. Some grains show a tendency to cross with a broader type than true Iowa.

Class 378.—Any other White Dent breed. One entry.

First.—No. 1761. J. Fowler & Co., Vereeniging, Heidelberg District.

Apparently a cross-bred with Louisiana strain in it. Grain of good quality and condition but inclined to be brown at the tips; ears firm, rather short; a promising strain.

Class 379.—Any Yellow Dent breed. Four entries.

First.—No. 1762. C. Woods, Standerton (Box 1483, Johannesburg). Moisture, 14.7 per cent.

Second.—No. 1763. Malcolm & Adams, The Grange, Parys, Orange Free State. Moisture, 22 per cent.

Neither exhibit was quite dry, but due allowance was made for difference in moisture.

Class 380.—Any White Flour (bread) breed. Only one entry.

No exhibit.

Bread mealies have almost disappeared from our shows with the introduction of better breeds, perhaps on account of their low feeding value and poor keeping qualities.

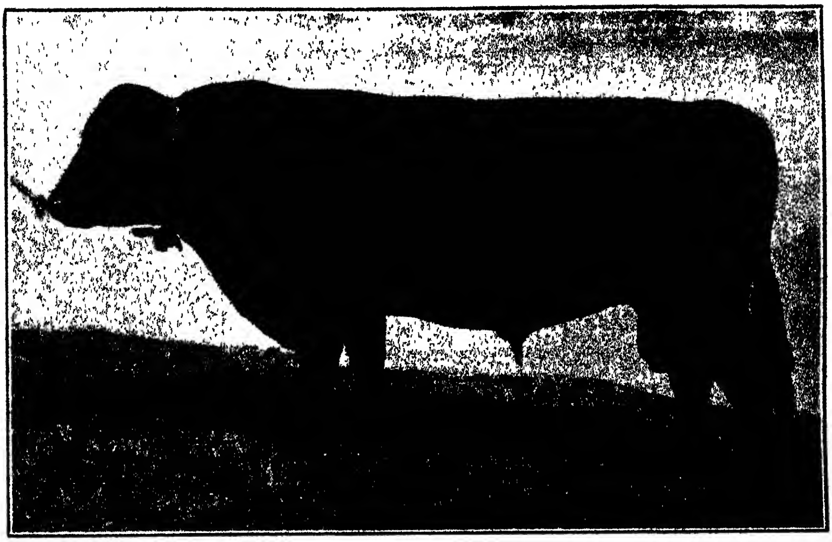


Photo by T. Brittain.]
Sir T. Cullinan's Red Poll Bull "Rothschild." Champion and Two Firsts, Johannesburg.

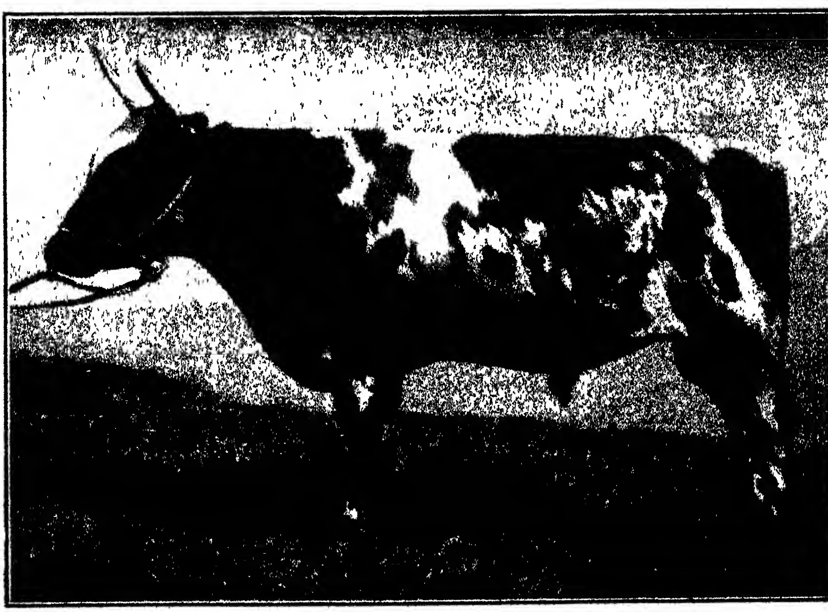


Photo by T. Brittain.]
Mr. J. McIntosh's Ayrshire Bull, Transvaal Bred. Winner Two Firsts, Johannesburg.

Class 381.—Any White Flint breed. Two entries.

First.—No. 1767. F. le Roux, Volksrust, District Wakkerstroom.

Second.—No. 1766. H. A. Mostert, Spitzkop, District Ermelo. Moisture. 10 per cent.

The size and quality of the grain are good; the smaller size of No. 1767 gives it the preference, being a flint. Both could be improved as regards uniformity by the selection of ears with straighter and more even rows.

Class 382.—Any Yellow Flint breed. Only one entry.

First.—No. 1768. H. A. Mostert, Spitzkop, Ermelo. The only exhibit.

The grain is dry (moisture, 11.6 per cent) and of good quality and condition, but considerable improvement could be effected by the selection of ears having greater uniformity of grain and straighter rows; the ears have not been well selected.

SECTION B.—BEST TEN BREEDING EARS.

Class 383.—Hickory King. Thirteen entries.

First.—No. 1778. Reynolds Bros., Val Station, District Standerton.

Second.—No. 1781. J. Fowler & Co., Vereeniging, District Heidelberg.

Third.—No. 1775. J. Stiell, Kinross, District Standerton.

Highly Commended.—1770. F. le Roux, Volksrust, District Wakkerstroom.

An excellent exhibit, showing marked improvement over previous years. The closeness of the competition is a highly encouraging feature. Transvaal mealie growers are improving greatly in their methods of selection.

Class 384.—Louisiana (ten-row) and Hickory Horsetooth.

First and Championship of the Section.—No. 1790. J. Fowler & Co., Vereeniging, District Heidelberg.

Second.—No. 1787. Reynolds Bros., Val Station, District Standerton.

Third.—No. 1784. J. Stiell, Kinross, District Standerton.

Special.—No. 1783. M. Geerdts, Schapenrust, District Heidelberg. Late exhibit.

An excellent exhibit, also showing marked improvement over previous years; unfortunately No. 1783 was shown too late for competition.

Class 385.—Iowa Silvermine and Champion White Pearl. Four entries.

First.—No. 1794. J. Fowler & Co., Vereeniging, District Heidelberg.

Second.—No award.

Third.—No. 1792. W. R. Boden, Hopewell, Heilbron, Orange Free State.

The first prize is an excellent sample, though departing somewhat from the old type of Iowa Silvermine. There is nothing worthy of a second prize. No. 1792 is a very uneven exhibit, the grain being poor and the ears badly matured.

Class 386.—Virginia Horsetooth, Ladysmith, or North American. Only one exhibit.

The Agricultural Show Season, 1912.

Fries Cow. "Letta," 1044. N.R.S. Champion at Johannesburg Shows, 1910, 1911, and 1912. Property of Government Experimental Farm, Potchefstroom.

First.—No. 1795. J. Fowler & Co., Vereeniging, District Heidelberg. An excellent sample.

Class 387.—Any other White Dent breed. Three entries.

First.—No. 1796. H. H. Dixon, Witbank, District Middelburg, Transvaal.

Special.—No. 1797. M. Geerdts, Schapenrust.

A nice exhibit showing improvement over last year. Mr. Dixon's cross-bred appears to be worth further development. Mr. Geerdts' entry was not found till after the judging was completed, or it would perhaps have had a better place; it appears to be a newly imported breed.

Class 388.—Chester County Mammoth. Four entries.

First.—No. 1799. C. W. Dennell, Vaalbank, Breyten, District Ermelo.

Second.—No award.

The exhibits are not up to the standard of previous years, which is unfortunate, as there is a growing demand for this breed which—on account of the small size of the grain and its high nutritive value—is proving more acceptable to the English market than the broader-grained yellow breeds. No. 1800B was immature and very wet, not in a condition suitable for competition in this class.

Class 389.—Eureka. Seven entries.

First.—Haggett & Ovens, Ventersdorp, District Potchefstroom.

Second.—C. Woods, Standerton (Box 1483, Johannesburg).

Third.—Malcolm & Adams, The Grange, Parys, Orange Free State.

It is gratifying to note the increased interest taken in this useful breed.

Class 390.—Yellow Hogan. Only one entry.

No exhibit.

Class 391.—Any other Yellow Dent breed. Two entries.

Only one exhibit. No award.

No. 1810 exhibited by Messrs. Jos. Smith & Sons, Val Station, is a nice exhibit of well-grown and well-selected ears, but having been badly crossed with a white breed, and neither colour having been fixed, no award was made, as it is undesirable to encourage the cultivation of mixed yellow and white maize; otherwise the exhibit would have been well worthy of a prize.

Class 392.—Any White Flour (bread mealie) breed. Only one entry.

First.—No award.

Second.—F. le Roux, Volksrust, District Wakkerstroom. Not up to the standard of a first prize.

Class 393.—Any White Flint breed. Two entries.

First.—No. 1813. F. le Roux, Volksrust, District Wakkerstroom.

Second.—No award.

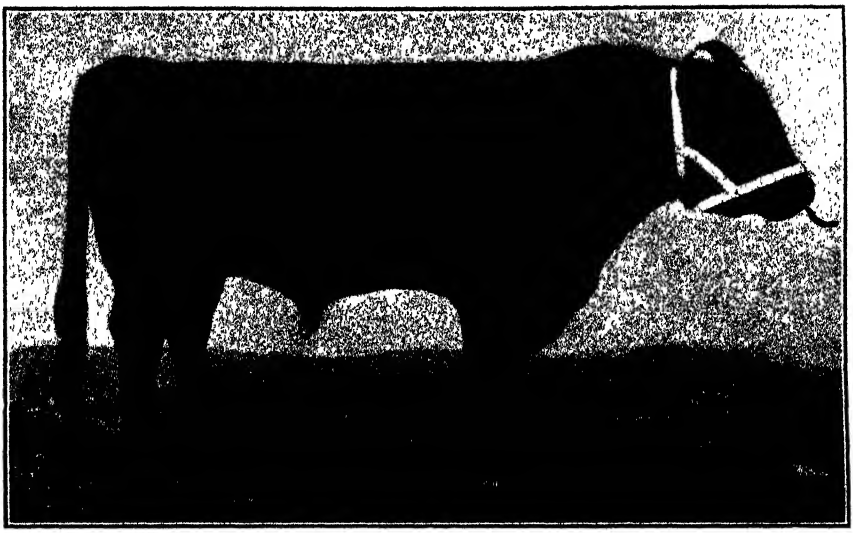
Third.—No. 1812. H. A. Mostert, Spitzkop, District Ermelo.

No. 1812 is not up to the standard of a second prize; the ears should have been "groomed", at least to the extent of removing the black tips.

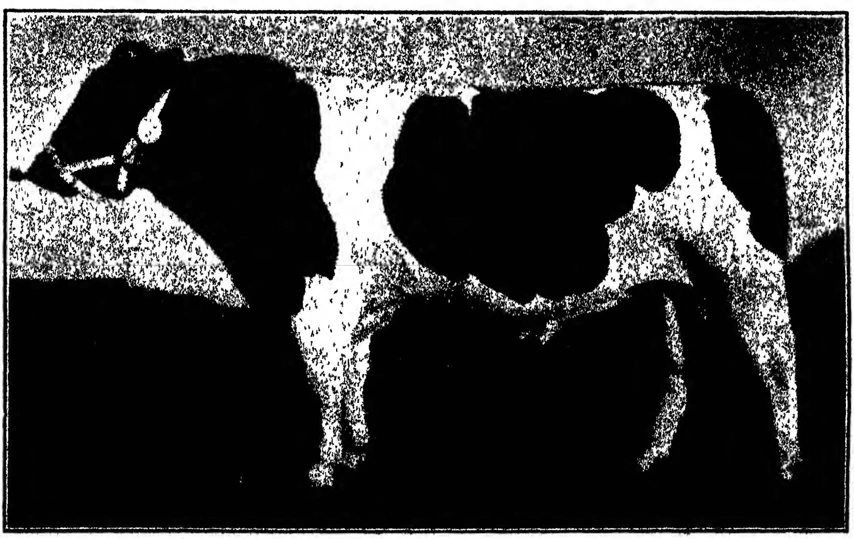
Class 394.—Sugar maize. No entries.

Class 395.—Pop maize. One entry.

No exhibit.



Reserve Shorthorn Champion, Port Elizabeth. Messrs. Maitin & Co.



Imported Friesland Bull, Reinold III. First and Champion, Heidelberg (Taansvaal), and Second in Open Class at Johannesburg.

SECTION C.—BEST SINGLE BREEDING EAR.

Class 396.—Hickory King. Thirteen entries.

First.—No. 1823. Reynolds Bros., Val Station, District Standerton.

Second.—No. 1821. John Stiell, Kinross, District Standerton.

Third.—No. 1827. W. W. Hosken, Hartebeeste, Ennerdale South, District Krugersdorp.

The large number of entries, the improvement in quality and selection, and the consequent keenness of competition, are the most encouraging features of this year's maize exhibits.

Class 397.—Louisiana and Hickory Horsetooth. Eight entries.

First.—No. 1833. Reynolds Bros., Val Station, District Standerton.

Second.—No. 1834. Jos. Smith & Sons, Val Station, District Standerton.

Third.—No. 1830. J. Stiell, Kinross, District Standerton.

An excellent exhibit. These two breeds are proving well adapted to high veld conditions.

Class 398.—Iowa Silvermine and Champion White Pearl. Four entries.

First.—No. 1836. H. H. Dixon, Witkop, District Middelburg.

Second.—No award.

Third.—No award.

Special.—No. 1837. This would have had first place but was not exhibited in time.

Class 399.—Ladysmith, North American, or Virginia Horsetooth. One entry.

No exhibit.

Class 400.—Any other White Dent breed. Three entries.

First.—No. 1841. H. H. Dixon, Witbank, District Middelburg.

Second.—No award.

Third.—No award.

Special prize.—M. Geerdts, Schapenrust, District Heidelberg.

No. 1841 is a nice ear, but weak in several points; will undoubtedly improve with further selection. Mr. Geerdts' exhibit was not shown in time to be judged with the other entries.

Class 401.—Chester County Mammoth. Three entries.

No award; a very poor exhibit.

Class 402.—Eureka. Six entries.

First.—No. 1846. C. Woods, Standerton. Also champion of the section.

Second.—No. 1849. Haggett & Ovens, P.O. Ventersdorp, District Potchefstroom.

Third.—M. Geerdts, Schapenrust, District Heidelberg.

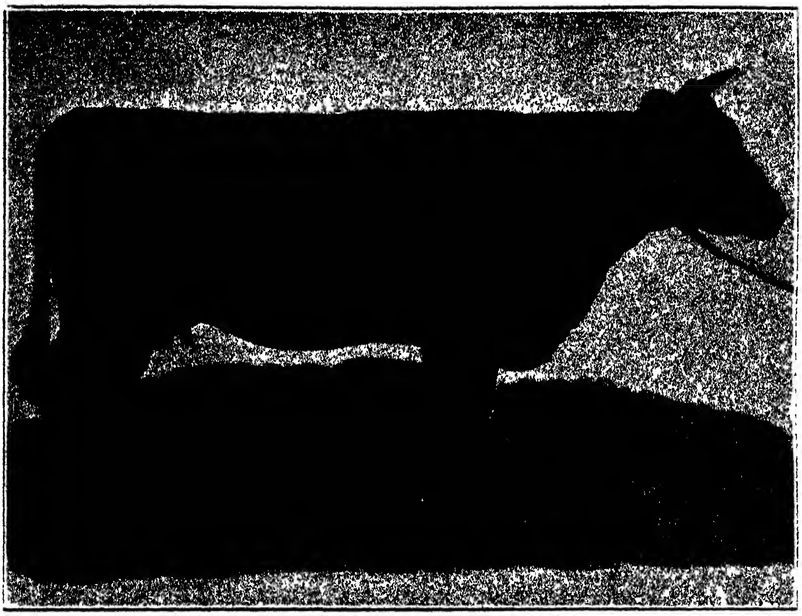
Some excellent entries were spoiled by having been crossed with whites and were disqualified accordingly.

Class 403.—Yellow Hogan. One entry.

No exhibit.

Class 404.—Any other Yellow Dent breed. Two entries.

Exhibits not considered worthy of an award.



Winning Shorthorn Cow and Calf at Grahamstown. The property of Messrs. W. Weeks & Sons, Sandflats.

Class 405.—Any White Flour (bread) breed. One entry.

First.—No award.

Second.—No. 1855. F. le Roux, Volksrust, District Wakkerstroom.

Poor exhibit.

Class 406.—Any White Flint breed. Two entries.

First.—No award.

Second.—No. 1857. F. le Roux, Volksrust, District Wakkerstroom.

Poor exhibit.

Class 407.—Any Yellow Flint breed. One entry.

No award.

Class 408.—Sugar Maize. No entries.

Class 409.—Pop Maize. One entry.

No exhibits.

Class 410.—Best three muids of White Flat (Dent) Maize. Five entries.

First.—No. 1864. J. Fowler & Co., Vereeniging, District Heidelberg.

Second.—No. 1862. Reynolds Bros., Val Station, District Standerton.

Third.—No. 1860. H. A. Mostert, Spitzkop, Ermelo District.

Tested for moisture content these exhibits gave

No. 1862, 23.4 per cent.; No. 1864, 20.4 per cent.; No. 1860, 12.4 per cent.; No. 1863, 11.8 per cent.

Though the wettest samples received the prizes full points were allowed for dryness. The points gained were

No. 1864—46½ out of a possible 55;
No. 1863—31 out of a possible 55;
No. 1862—36 out of a possible 55;
No. 1860—33 out of a possible 55.

These exhibits were not quite up to the standard of some years.

Class 411.—Best three muids of Yellow Flat (Dent) Maize. Three entries.

First.—No. 1866. J. Fowler & Co., Vereeniging, District Heidelberg. Moisture, 9.8 per cent.

Second.—No. 1865. C. Woods, Standerton. Moisture, 11.6 per cent.

Third.—No award.

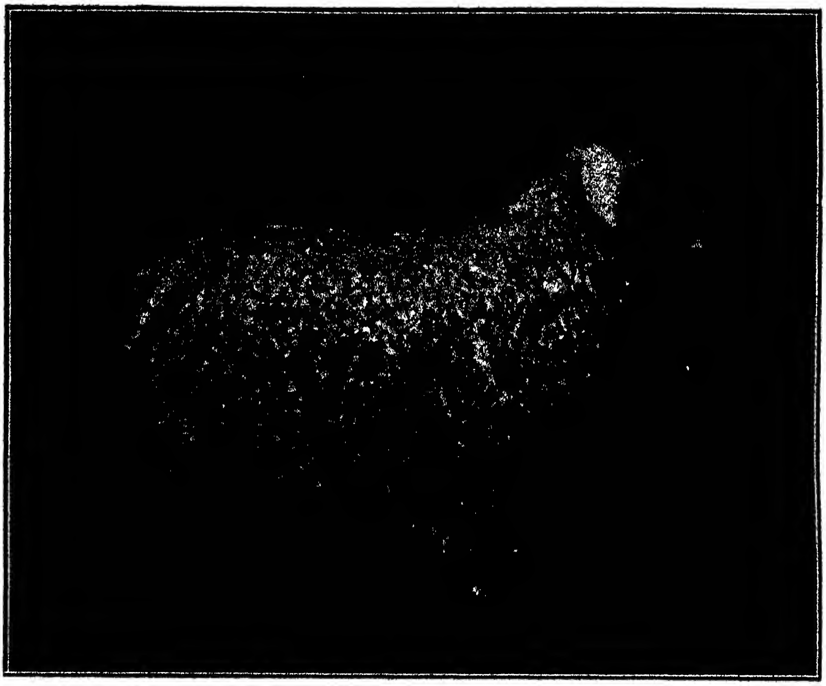
Class 412.—Best three muids of Yellow Round (Flint) Maize. One entry.

First.—No. 1867. H. A. Mostert, Spitzkop, Ermelo District.

An excellent exhibit. Moisture, 10.7 per cent.

The moisture tests were carried out by Mr. W. G. Wright, of the Chief Grain Inspector's Division, who has kindly furnished the following summary of results. Some exhibits were from last year's crop, but this is admissible under the rule that they must have been harvested within the twelve months immediately preceding the show.

Exhibit No.	Percentage.
1752	20.2
1759	11.6
1760	13.8
1762	14.7



Champion Angora Ewe, Grahamstown. Mr. R C. Holmes, Kendrew

Champion Angora Ram, Grahamstown. Mr. R. C. Holmes, Kendrew.

Champion Rambouillet Ram, Port Elizabeth and Bloemfontein. Bred and owned by Mr. J. G. Minnaar, Graaff-Reinet.

Champion Angora Ram, Port Elizabeth. Mr. R. C. Holmes, Kendrew.

Exhibit No	Percentage.
1763	22.0
1766	10.0
1768	11.6
1860	12.4
1862	23.4
1863	11.8
1864	20.4
1865	11.6
1866	9.8
1867	10.7

JUDGE'S REPORT ON PRODUCE AT THE JOHANNESBURG SHOW, 1912.

By W. H. HORSFALL (Winburg, Orange Free State), Judge, Produce Section.

GENERALLY speaking, the exhibits in this section were amongst the best which it has been my privilege to judge in this country, not only numerically, but in point of quality, and, in many cases, the keen competition which makes judging a pleasure. Two cases in particular stand out prominently as deserving of special mention, namely, Class 426 (Wol-Koren).

The three exhibits in this class are of exceptionally fine quality, the first prize-winner, grown by Mr. C. G. F. Richter, Leeuw Kop, Bloemfontein, being the best I have ever seen in this class; the competition was so close that the third prize-winner scaled 65½ lb. per bushel, being within 1 lb. per bushel of the first prize-winner. In my experience this is quite exceptional.

The other class referred to above is No. 429 (Red Fife Wheat). I refer particularly to the first prize-winner, which is a very fine sample, possessing to a remarkable degree the special characteristics which are pre-eminent in the original importation which comes from Manitoba. To emphasize this more prominently there is always a demand in this country for a strong glutinous flour of high character, which, up to now, has only been met by the importation of large quantities of Canadian and American hard spring wheat flours, because it has not been possible to procure the wheat in this country possessing the necessary characteristics except by importing it.

It has fallen to the lot of Mr. F. le Roux, a Volksrust farmer, to prove that this demand can be met by producing wheat of the original character on the spot, which is no small achievement, and all honour and credit are due to Mr. le Roux for what he has done in this direction.

In the Boer Meal classes, sifted and unsifted, the contrast in the former was very marked, the first and second prize-winners producing keen competition and being of a very high grade, remaining exhibits being very poor, for which the miller is mainly responsible. This also applies to the unsifted class, one exhibit of which, in my opinion, was not a genuine sample of unsifted Boer meal.

In the yellow and white mealie meal classes the quality of the prize-winners was of a high standard and showed good milling.

The Transvaal-grown dry-land winter and summer grown wheat classes brought forth some good classes, and is deserving of further encouragement in this direction.

The Chevalier malting barley class had two exhibits of very fine quality, good colour, and condition, and well cleaned.

In most of the oat classes there is close competition, the samples generally being of good quality, bright, clean, and heavy.

It is refreshing to see that buckwheat is capable of being produced in this country, the samples exhibited being very close and well grown, but would recommend some of the exhibitors to see that their samples are better cleaned.

Linseed. The only sample shown was of good quality. I should like to see more competition in this class as there should be a good demand in South Africa for stock feeding.

Rape Seed (for birds). A nice sample. Is it South African grown? If so, it is the first exhibited here—at any rate in recent years.

Millet seed (for birds). The first prize-winner was of excellent quality. The second was badly cleaned.

Canary seed (for birds). An excellent exhibit, remarkably heavy.

Boer manna seed. A nice exhibit.

Teff seed. The heaviest seed sample is least mature. The question of maturity of seed and freedom from weed seeds are crucial ones.

I cannot close this report without making special mention of one exhibit (not for competition), No. 442A, by Messrs. Smits Brothers, Tweefontein Farm, P.O. Davel. This consisted of five samples of oats, four of the white variety, and one of the black winter variety grown from *imported pure English seed oats* on dry land. This is another very striking example of what pure seed combined with good cultivation, is capable of producing in this country.

One sample of the white variety reached as high as 40½ lb. per bushel, being a record for the show. Would that there were more Smits Brothers in South Africa; it would be a much greater country than it is to-day.

I should strongly recommend that a special award be made to this firm for its exhibit, as it is certainly deserving of one.

THE BLOEMFONTEIN SHOW.

The Central Agricultural Society of the Orange Free State held their annual show at Bloemfontein on the 16th, 17th, and 18th April. With the exception of a little light rain, the weather was very favourable, and there was a large attendance of visitors from all parts of the country.

The great feature of the show was, of course, the stock. Cattle, horses, and sheep offered an excellent show as regards both numbers

The New Dining Hall at Rosebank Agricultural Show Grounds.

Judging the Jacksiat Rosebank.

The Agricultural Show Season, 1912.

Ayrshires on Parade at Rosebank.

Parade of Frieslands at Rosebank.

Driving Competition at Rosebank.

and quality. The pig section, too, was quite a good one, and contained some fine animals.

In the cattle section there were fewer animals of inferior merit to be seen among the Shorthorns than in the Friesland classes, while the young bull classes of the former were superior to the similar classes of the latter. In the Shorthorn classes three good breeders from the Cape were among those represented, namely, Messrs. Geo. King & Son, Cuthbert Pope, and Edwards Bros. Mr. J. H. Diesel, too, did well in this section. Frieslands were well represented by exhibits from some of the best breeders throughout the country; at the same time, there were a number of animals in this section which were unworthy of a place in the yard, being obviously entered for sale purposes. The male championship for Friesland cattle was awarded to Findlay Best's "Brava II." This is a massive, handsome bull of true Friesland conformation and character, and was a comparatively easy winner. In the classes for the best group of Friesland cattle, consisting of six animals, there were no less than nine entries—54 animals. The judges selected the following four groups: the Orange Free State Settlement Board, A. M. Ackermann, W. H. Bartlett, and Sir George Farrar; and in judging by points the judges found that Sir George Farrar's exhibit won comparatively easily. Sir George Farrar, who exhibited his Friesland cattle for the first time at this show, obtained a number of awards. His cow, "Bouwkje," which won the championship for the best Friesland cow, was greatly admired. The next strongest class was the South Devons. The competition lay principally between the Orange Free State Settlement Board and Messrs. Grepe Bros.; except in the case of the cows, Messrs. Grepe Bros. generally were victorious. Their bull, "Minister," which won the championship for the best male in the South Devons, is a massive animal of fine quality. Red Polls made a good show. The exhibits of S. C. Scaife and K. Edwards in particular were of a high standard. Though this breed has not found much favour generally throughout the Orange Free State, it has proved successful in different parts of the Province. Ayrshires were disappointing. North Devons presented a small show, being confined to the animals of Messrs. H. L. and J. O Southey; their animals, however, possessed quality and true character. Another interesting exhibit was the Swiss cattle belonging to Messrs. Edwards Bros., of Schoombie.

In the Thoroughbred classes of the horse section, his Grace the Duke of Westminster's "Tankard" secured "first" in the class for stallions three years and over (open); his "Fledermaus II." was awarded "first" for the best yearling colt; and his "Rockhill" for best brood mare, three years and over. Mr. W. A. Bester's "Hopwood Victory" was awarded "first" in the class for Hackney stallions; and Mr. T. Keel's "Forrest Laird" in the class for Clydesdale stallions. The first prize for Percheron stallions was secured by Mr. T. Jones' exhibit. Mr. W. A. Bester also secured "first" in the class for Hackney mares; Mr. R. A. Forbes in the Clydesdale mare class; the Bloemfontein Town Council "first" and "second" in the class for Shire mares; and Messrs. Grepe Bros. "first" and "second" for the Suffolk Punch mares. The remount classes formed an interesting feature. The "first" awards were as follows:—Best mare or gelding, 14.1 to 14.3, J. H. Morton; best mare or gelding for

cavalry remounts, J. F. van der Merwe, jun.; best mare for breeding mounted infantry remounts, H. T. Sills; best mare for breeding cavalry remounts, his Grace the Duke of Westminster; best mare for breeding artillery remounts, A. Oliff. There was also a good show of carriage and draught horses, and mules and donkeys.

There was a fine show of sheep, Merinos being very strongly represented in their various types. In this section Messrs. C. Adams & Sons, F. W. Southey, and J. S. Minnaar did particularly well. In the classes for Tasmanian, Vermont, or Allied Types, Mr. J. H. King secured "first" for best Merino ram over 2½ years (open), and Messrs. C. Adams & Sons for the corresponding class under 2½ years. In the classes for Rambouillet, Wanganella, and allied types, the first prize for best Merino ram over 2½ years (open) was secured by Mr. J. S. Minnaar; and Mr. A. Luckhoff was awarded "first" in both the classes for best Merino ewe over and under 2½ years respectively of the same types.

The show of goats also was good. The awards in these classes were distributed between Messrs. A. B. and W. G. Hobson and R. Cawood.

Pigs were another fairly good feature of the show. The exhibit of poultry was not as good as might have been expected, but there were some good birds to be seen.

There was a very good show of wool and mohair. Farm produce was fair, with the exception of mealies, which were poor. There were some good exhibits in the dairy section, though this section was not as strong as might have been expected in the Free State. The machinery section was a most excellent one. A large number of firms from various parts of South Africa were represented, and the exhibits were fairly comprehensive.

"Friesland" Cattle and their Points.

(Lecture delivered by Mr. ALEX. HOLM, General Manager, Experimental Farm, Potchefstroom, at the Port Elizabeth and Bloemfontein Shows, 1912.)

HISTORY.

THE Dutch and Friesian cattle possess purity of breeding extending over a period of years longer probably than that of any other pure breed. Professor Hengeveld states that the Dutch horned cattle have a "pedigree" extending to upwards of 2000 years ago, and that they are descended directly from the cattle owned by the Frisians and Batavi; further, that since that period there has been for all practical purposes almost an entire absence of the introduction of alien blood. But it is only within the last 50 years or so that the breeds of cattle of Holland have become well fixed in type and character.

RECOGNIZED BREEDS OF CATTLE IN HOLLAND.

There are three distinct and pure breeds:—

1. *Fries or Zwart-bont*—the Black and White.—It is registered in the following Herd Books:—

   (*a*) Het Friesch Rundvee Stamboek, established in 1879.
   (*b*) Nederlandsch Rundvee Stamboek, established in 1874, reorganized in 1907.
   (*c*) Holstein-Friesian Association of America, 1885.
   (*d*) British Holstein (recent).

2. *Groningen or Zwart-blaar.*—Registered in section of Nederlandsch Rundvee Stamboek.

3. *Meuse-Rheine-Yssel.*—Also registered in section of Nederlandsch Rundvee Stamboek.

GENERAL QUALITIES OF THESE BREEDS.

Their powers of flesh and milk production have been classified as follows:—

Fries.—40 per cent. flesh production; 60 per cent. milk production.

Groningen.—55 per cent. flesh production; 45 per cent. milk production.

Meuse-Rheine-Yssel.—50 per cent. flesh production; 50 per cent. milk production.

The *Fries* breed may therefore be regarded as essentially dairy cattle, the *Groningen* as beef cattle, and the *Meuse-Rheine-Yssel* as dual purpose animals.

The last two breeds may be dismissed with a short reference. They are at present of comparatively little importance in South

Africa, inasmuch as although individual specimens of each may be seen, there exist in this country no pure herds of these breeds.

The *Groningen* breed is black in colour, with white head—sometimes black round the eyes—underline of belly white, legs white from below knees and hocks to hoofs. It is more symmetrical in outline than the other breeds, and is better covered with flesh. In size it is a little smaller than the Fries, but is larger than the Meuse-Rheine-Yssel.

The *Meuse-Rheine-Yssel* breed is red and white in colour, with red predominating. It is set on comparatively short legs, and it is wide and deep in the body. It is frequently deficient in the hind quarters, but it possesses a good constitution and much hardihood. It is the smallest of the three Holland breeds, and is found chiefly on the lighter and less fertile soils of that country.

In days gone by there existed a race of Dutch Belted cattle—with a large band of white around the middle part of the body, but they are now practically non-existent.

NOMENCLATURE.

Before dealing with the "Friesland" breed, the one with which we are now chiefly concerned, its nomenclature may be profitably discussed.

The name "Friesland" is a South African one only, and appears to be wrong. It refers to a Province of that name in Holland, but inasmuch as in that Province of Friesland there are to be found the three distinct pure breeds already mentioned, this term "Friesland" is confusing and misleading. In other countries the name given to the breed also varies somewhat, but in each case there is some justification for the nomenclature used.

In the United States of America the breed is called "Friesian Holstein" or "Holstein Friesian"; in Britain, where an endeavour has within the last two or three years been made to establish the breed, it is called "British Holstein."

The Dutch or Holland names are (*a*) "Friesch"; (*b*) "Friesian Holland"—contracted to "Holland."

The correct English translation is probably "Friesian," but for South Africa, with the modern spelling in the Afrikaanse Taal, the name by which this breed should be known is "Fries." It is a point worth consideration whether, in order to prevent the confusion and the error in the use of the word "Friesland," we ought not henceforth to call the breed simply "Fries."

The *Fries* breed is the largest of all the breeds of cattle of Holland. In Holland full-grown animals weigh from 1250 lb. to 1650 lb. In South Africa the weight may be taken at from 100 lb. to 200 lb. less. The size of the animals depends to a great extent upon the character of the land upon which they are reared, the feeding, system of management, and so forth. This breed is native to the Provinces of Friesland, North Holland, and South Holland. It is also found in the Province of East Friesland, a part of German territory, where through selection and breeding some difference in type has been created. A large export trade is done with Russia, Japan, France, America, and to a considerable extent with South Africa.

This Fries breed is noted in many parts of the world for its excellent dairying qualities. It is remarkable for its large yield of

milk, and in this respect it is excelled by no other breed. Cows yielding from 1000 to 1400 imperial gallons of milk during the ordinary lactation period are not uncommon. But the quality of their milk is comparatively poor. In butter fat it is from .75 to 1 per cent. poorer on an average than the milk of, for example, Shorthorns, Ayrshires, and South Devons. The average of herds in Holland is in the neighbourhood of 3 per cent. butter fat. In the United States of America, through the aid of milk records and testing and selection in breeding, the butter fat percentage has been increased, while at the same time the high yield has not been sacrificed. The Fries, being a large breed, consumes large quantities of food, and in order to rear it to the best advantage it requires good land, highly nourishing food (whether of natural pasture or otherwise), and good management. It has been abundantly proved that it acclimatizes well to South African conditions, though as a breed it cannot be regarded as one possessing much natural hardihood. Among all cattle in South Africa it is highly desirable to have good constitutions, but among dairy breeds in particular there is a danger that dairying qualities may be developed at the expense of constitution. In the severe conditions obtaining throughout South Africa at the present time it is better to sacrifice a little milk production rather than breed stock of weak constitutions.

The lecturer then proceeded to demonstrate the "points" of the breed on animals brought into the ring. Before doing so he explained that it was difficult to get an authoritative description of the breed, as in the home of the breed the official descriptions were very meagre, but he had compiled the following "standard of excellence" from the "Ideal Form of Fries Cattle," as described by Het Friesch Rundvee Stamboek and the Holstein Friesian Association of America, supplemented by knowledge he has gained in study and in discussing the subject with some of the best breeders in Holland and in South Africa.

STANDARD OF EXCELLENCE FOR FRIES COW.—BY HOLM.

Head.—Fine and elegant, of medium length, comparatively long from eye to base of horn; broad and slightly dishing between the eyes; space between setting of horns rather narrow, and inclined to be "polled" on crown, i.e. not flat and wide between horns.

Eyes.—Large, full, and bold, yet mild and placid. A small flat or sunken eye is undesirable.

Muzzle.—Blue, broad yet not coarse, nostrils large.

Horns.—Fine and flat or oval in cross section; short, and position a little downward, bent forward and inward.

Ears.—Fine, comparatively large, hanging elegantly from head and fringed with long fine hair.

Neck.—Long, moderately thin, and slightly curving along top line; not deep from nape of neck to throat; nearly free from dewlap; neatly joined to head and shoulders. Shoulder vein not too full and fleshy.

Chest.—Deep; broad between shoulder points; brisket not too heavy and fleshy.

Shoulders.—Closed well to the body; deep and broad, but not too heavy; running neatly into withers and ribs.

Withers.—Of medium width, even over shoulder tops; slightly lower than hips.

Crops.—Full, and level with shoulders.

Back.—Straight; backbone open spaced.

Ribs.—Long or deep; gently curving from back; distance between last rib and hip bone not long.

Flanks.—Moderately deep and full, with large abdomen.

Loins and Hips.—Moderately broad; full; in bull slightly rounded rather than flat; hip bones not too prominent and lightly covered with flesh.

Rump and Crupper.—Long and broad; highly set, full and level, sloping little.

Hind Quarters.—Deep and broad, muscles well developed in exterior, not thick and fleshy on interior lines. Pin bones wide apart (giving roomy pelvis) and not fleshy. Nearly straight from pin bones to Achilles tendon (ham string); level to root of tail, with strong "bands."

Legs.—Of moderate length; bone of good quality, not coarse; joints strong; movement firm and straight; hoofs of medium size, deep, and not spreading.

Tail.—Long and fine; fairly strong at root but tapering to a good switch.

Udder.—Long, deep, and wide, extending well forward to belly line, and well up and broad behind; well defined veins; texture fine, soft, and elastic, not coarse and fleshy; teats of medium length and thickness, spaced well apart, blue colour preferred for South African conditions.

Milk Veins.—Large and prominent, tortuous along their course; ending well forward along belly line in large orifice or "well."

Escutcheon.—Well developed and well defined.

Colour.—Black and white; white stripe over shoulders and over crupper; white star on forehead; four white legs, preferably without isolated black spots below knees and hocks; colours sharply defined, not intermingling; blue spots on white permissible, but preferable without.

Hair.—Fine and soft.

Skin.—Moderate thickness, loose, pliable and mellow to touch. Secretions seen in ear, rich yellow, oily and abundant.

The "points" of the bull are for all practical purposes similar, but instead of the feminine outlook, which is essential in the case of the cow, the bull should possess evidence of full vigour and strong masculine character. A bull with a feminine head, with light bone, and an absence of character, will not prove to be a good sire. By breeding from such sires the herd will surely degenerate and be wanting in character and constitution. Owing to the scarcity of pure-bred sires in South Africa bulls possessing feminine appearance are too often used, instead of being castrated as would be done in other good stock-breeding countries.

In regard to colour, the tendency in South Africa is to secure a predominance of black. This is due to the general desire to get blue teats, as they do not suffer from scorching in this sunny climate as the white teats of this breed often do. The result is that the black markings often extend further down the legs than the ideal demands: consequently there is a greater tendency for black spots on the pasterns

to appear. These black spots do not necessarily prove impure breeding, as they are to be found on fully pedigreed animals. They should be regarded as a blemish, not as a disqualification. But these excessive black markings are in the presence of other features one of the best indications of impure breeding. In South Africa in particular, where there are so many cross-bred and grade Fries cattle, they should be carefully scrutinized. These indications of impure breeding may be found in the following features—a head very long, narrow and full in the forehead, with long or erect horns,

A Good Fries Head. Cow DOA, 29P.

broad and flat between the horns; a short thick and deep neck with development of the scroff; hind quarters sloping and rounded, and weak in the second thigh. The black colour is also of that intense "dead" black, while in pure-bred Fries cattle it is often slightly tinged with brown, especially on the cheek bones, the elbows, and the buttocks. Bulls with blue or blue marked rudimentary teats are more likely to beget females with the desired blue teats than those with white rudimentary teats. The same applies to a partly blue scrotum, sometimes found in a pure-bred bull possessing much black on the body. A white scrotum is preferred, but previous remarks

in regard to these colour markings, which may in the case of a black or blue scrotum be an indication of impure breeding, apply. In America the cattle of this breed are often more white than black, and are much more spotted in their colour markings. The white stripe down the face is also common among American-bred animals.

The essential differences in the conformation of the Fries and other breeds were demonstrated on the animals before the audience, and it was explained that the general conformation of this breed was rather that of a parallelogram than of the wedge shape usually found in other dairy breeds.

Appended are the "Scale of Points" for bulls and cows adopted by "Het Friesch Rundvee Stamboek" and the "Nederlandsch Rundvee Stamboek."

SCALE OF POINTS OF HET FRIESCH RUNDVEE STAMBOEK.

Cows.

Maximum Number of Marks.		Description.	Number of Marks Obtained.
8	...	Head—shape, eyes, nose, and horns.	
10	...	Neck, shoulders, breast.	
8	.	Chine (back), ribs, and flanks.	
8	...	Loins.	
12	...	Crupper (rump).	
6	...	Thighs.	
4	...	Tail.	
6	...	Legs.	
20	..	Udder, teats, milk indications.	
18	..	General appearance (also skin and hair) and gait.	
100			
5	...	Pedigree.	
		Milk production.	

Bulls.

9	...	Head, shape, eyes, nose.	
6	...	Horns.	
12	...	Neck, breast, withers, shoulders.	
15	...	Ribs, chine (back), loins.	
9	..	Crupper (rump).	
7	...	Thighs.	
3	...	Tail.	
8	...	Legs.	
6	. .	Milk indications, skin, hair.	
25	...	General appearance, skin, hair, and gait.	
100			
5	...	Pedigree.	
		Milk production of the mother.	

SCALE OF POINTS OF THE "NEDERLANDSCH RUNDVEE STAMBOEK."

Maximum Number of Marks.		Description.	Number of Marks Obtained.
		Cows.	
4	...	Shape—head, eyes, nose.	
5	...	Horns.	
7	...	Neck and breast.	

Maximum Number of Marks.		Description.	Number of Marks Obtained.
7	...	Withers and shoulders.	
5	...	Ribs and flanks.	
10	...	Chine (back) and loins.	
9	...	Crupper (rump).	
5	...	Thighs and buttock.	
4	...	Tail, tail-head, and bands.	
8	...	Position, course, and strength of legs.	
5	...	Hair and skin.	
10	...	Udder and teats.	
3	...	Milk veins, milk-holes, escutcheon.	
18	...	General appearance—proportion, quality, type.	
100			

Bulls.

7	...	Shape of head, eyes, nose.	
6	...	Horns.	
6	...	Neck and breast.	
7	...	Withers and shoulders.	
8	...	Ribs and flanks.	
9	..	Chine (back) and loins.	
10	...	Crupper (rump).	
6	. .	Thighs and buttock.	
4	..	Tail, tail-head, and bands.	
9	.	Position, course, and strength of legs.	
6	...	Hair and skin.	
4	...	Bag, escutcheon, veins, and teats.	
15	...	General appearance, proportion, quality, and type.	
3	...	Development in proportion to age.	
100			

Use of Explosives for Agriculture.

By Kenneth B. Quinar, General Manager, Cape Explosives Works.

In one of your late issues a correspondent asks for information regarding the use of explosives for ditching, etc. As the subject is naturally one which greatly interests me, I offer the following observations in the hope that they may afford your correspondent some information, or at least prove of passing interest to some of your readers. In fact I shall use his letter as an excuse to bring before the farming public a way of increasing the profit of their farms by the use of explosives.

Few people realize the variety of ways in which dynamite can be made to serve the farmer. Unfortunately farmers in this country, even more so than lay persons, give to dynamite of every description a very wide berth. In America, on the other hand, dynamite is regarded as the farmers' best friend, and the demand for dynamite for agricultural purposes has grown in the past few years from practically nil to many millions of pounds; indeed, at the present time, it is thought that this market for explosives will shortly be of more importance than is the mining industry.

Explosives are now used by the up-to-date farmer for tree planting, sub-soiling, ditching, stumping (removing old tree stumps), boulder blasting, road-making, and for a thousand and one other purposes which space will not permit me here to enumerate. The three first-mentioned uses are those most likely to prove of interest to South African farmers, and to these I will confine my remarks.

Tree Planting.—Our South African orchards and vineyards are planted in a great variety of soils, from the deep alluvial of the kloofs and valleys to the shallow (surface) soil of the hillsides. The former are usually more or less permeable to water, and are easily penetrated by the plant rootlets in their search for food. The latter are, on the other hand, usually underlaid by a hardpan, or if not a true hardpan, by a sub-soil which is very compact, hard, and difficult of penetration by the plant rootlets. A tree planted in the deep alluvial will establish itself in time and develop to normal proportions, even when planted in the inadequate hand-dug hole usual amongst the more progressive farmers. But a tree planted in soil underlaid by hardpan cannot so develop, as the rootlets are unable to penetrate the compacted sub-soil. Such trees rarely, if ever, have anything approaching a tap root, and are confined to the thin layer of surface soil for their food supply - a supply often only too rapidly exhausted. (See Fig. 1.)

In many cases the sub-soil is rich in plant food, i.e. potash, phosphorus, lime, etc., but as the water is the vehicle or carrier of these essentials to the plant, and it cannot penetrate compacted sub-soils or hardpans, these storehouses of plant food are not available to the trees, and the farmer is obliged to provide food in the shape of fertilizers—truly a case of "carrying coals to Newcastle."

Agricultural experimenters in the United States have shown that it is frequently the case, for soils underlaid with hardpan, that the surface or tilled layer upon which the tree depends for food will contain only 0.05 per cent. and 0.7 per cent. of phosphorus and potash respectively, whereas 3 or 4 feet below the surface the sub-soil contains 0.15 and 1.2 per cent. respectively.

Now to turn to the rôle played by dynamite in scientific tree culture.

A hole, 4 to 5 feet deep and, say, 1½ or 1¾ inches in diameter is punched or drilled on the exact spot to be occupied by the tree. At the bottom of this hole is placed a cartridge of suitable dynamite provided with the usual detonator and fuse, when the hole is carefully filled with moist earth and tamped with a wooden rod.

Upon exploding the cartridge of dynamite the surface of the earth is seen to rise a few inches and subside; then, after several minutes have elapsed, fine wisps of smoke may be seen rising from many small cracks radiating from the original hole. If now the ground, loosened by the explosion, is removed with a shovel it will be found that a "pot-hole" has formed at the point where the cartridge lay, and upon closely examining the walls of this "pot-hole" it will be seen that numberless fissures extend far back into the surrounding sub-soil, while above the "pot-hole" the ground is quite disintegrated, even in the most refractory cases.

In this hole the tree is planted in the usual manner, and the beneficial effects of the blast quickly become noticeable, for experience has shown that trees planted in this way are, after two years' growth, practically double the size of those planted in the ordinary way in spade-dug holes. The reason for this is not far to seek; it is only necessary to dig up a tree planted in hardpan, according to each of the two systems, when it will be noticed that in the case of the tree planted in the hole prepared with dynamite the roots are not only very much more numerous, but longer and more vigorous than in the case of the tree planted in the ordinary hand-dug hole. In other words, the roots are free to spread in all directions (Fig. 2), not only through the surface soil but also through the sub-soil which has been thoroughly fissured, and which is rich in plant food. Or to view the effect of the blast from another point: it becomes possible for water to permeate the soil and bring into solution the constituents necessary for plant life, thus rendering them readily accessible to the roots. Last, but not least, there is the point that a large reservoir for moisture is formed right under each tree, by reason of which "dynamited" trees promise to be practically drought-resisting; the rainfall, however slight, will be taken up by the soil (Fig. 2) instead of running to waste (Fig. 1).

The extraordinary feature of this method of preparing the ground for tree planting is that after the blast it would be quite impossible to tell from the surface of the soil that so important a change of condition had taken place.

This method of soil treatment seems advantageous for practically all soils and for practically all types of trees and plants. Very great increases in productivity have been observed to follow this treatment. Apple trees which had ceased to bear as a result of age and impoverished soil were made to yield fine crops by exploding, say, 7 or 8 feet below them, a single stick of certain explosive. Bearing orchards are often treated with advantage, especially in cases of exceptionally refractory hardpan.

Mr. H. E. V. Pickstone, of Groot Drakenstein, and Mr. Rowland Taylor, of Wellington, are both giving this method of soil treatment an extensive trial this year.

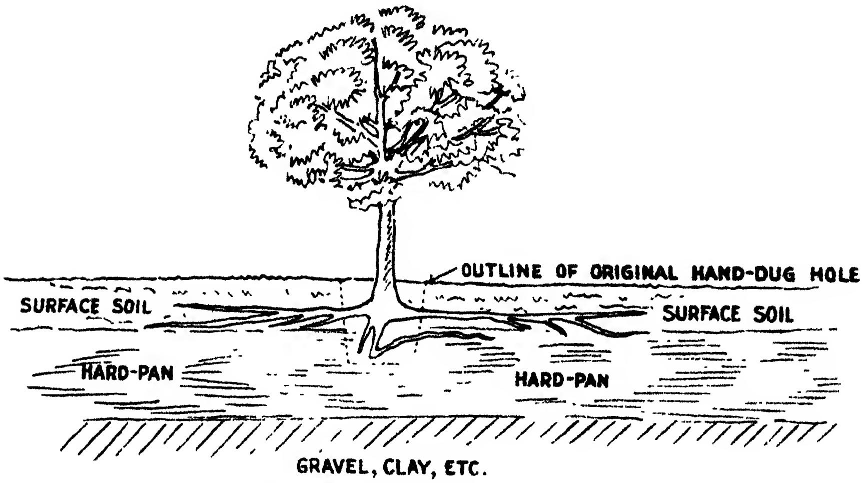


Fig. 1.—TREE PLANTED IN USUAL HAND-DUG HOLE.
In this case the hard-pan turns the vertical tap roots into laterals.

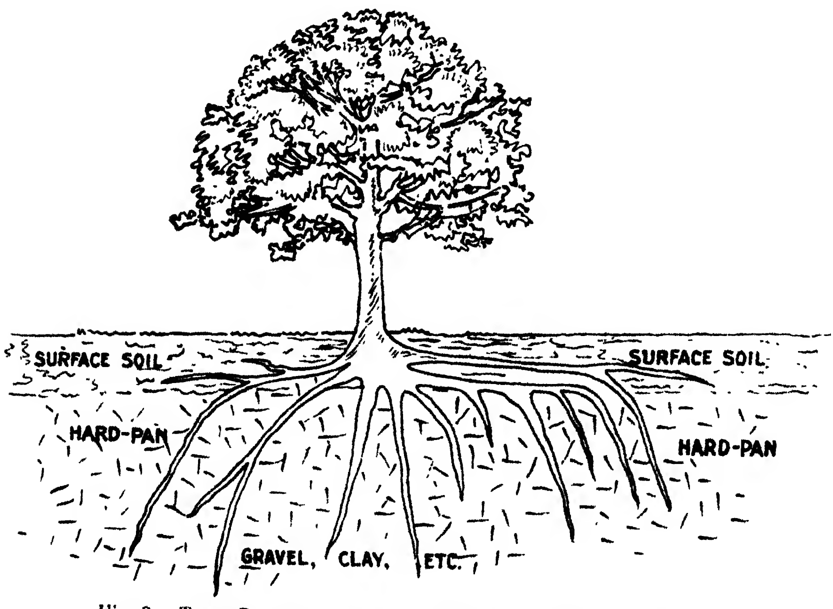


Fig. 2.—TREE PLANTED IN HOLE PREPARED WITH DYNAMITE.
In this case the root area of the tree is greatly increased, hence the greater growth.

Apply the same reasoning to the vine problem. Obviously, the better the soil the better the crop. Under present average conditions the farmer delves his ground before planting his sticks, if he be progressive, or contents himself with simple ploughing, if he be

conservative, and to this latter class, unfortunately, belong the great majority. If the soil has been delved it will be opened to a depth of, say, 18 inches, or at most 24 inches, and if ploughed to a depth of, say, 9 inches, or possibly 12 inches. Soil treated with dynamite, however, is opened to a depth of 3 feet 6 inches to 4 feet, *and that at less cost per acre than for delving to half the depth.* To punch a hole 4 feet 6 inches to 5 feet deep will take two farm boys about ten minutes all told; to load and fire it perhaps a further five minutes will be required, and it is estimated that the total cost per acre treated will be between £2. 10s. and £5, depending upon the nature of the soil and the number of trees to be planted per acre.

This being the case, it is in my opinion a *sine qua non* that existing vineyards—especially those on hillsides underlaid by hardpan—will benefit enormously by dynamite ploughing. My idea would be to punch holes in the centres of the rows, say, 6 feet or more apart, and, say, 3 feet 6 inches to 4 feet deep, and in these would be exploded a small quantity of certain dynamite. This would have the effect of fissuring the hardpan and allowing the vine-roots access to fresh food supplies, *and this without losing a season or injuring a vine.*

I am glad to say that Mr. Rudolph Scholtz, of the farm near our explosives factory, Somerset West, is making the experiment this season, and it is my hope that I shall next year be able to report figures for increased yield of grapes that will ensure the adoption of dynamite throughout the country as the best means of sub-soiling.

For lasting good, low initial cost of treatment, and enduring nature of improvement effected, dynamite ploughing will take the lead in Africa as it has in America.

Before leaving the subject of tree planting for the moment it will be well to mention that it has been found that in places where fruit trees have been killed by cut-worms and fungus in the soil, and these dead trees have been taken out and dynamite used to prepare holes for fresh trees, the new trees have not been troubled in any way by the fungus, the explosion of the dynamite having rid the soil of the pests.

Sub-soiling for Cereals, Forage, etc.—Where large tracts of land are to be treated for the culture of cereals, etc., the procedure is the same, excepting that the holes are not so close together. Holes from 15 to 25 feet centres, depending upon conditions, are the rule for this type of work, and it is claimed that very great increases in yield of oats and forage follow treatment of the soil in this fashion. It has been arranged to conduct experiments this winter on the farm of Mr. James Rawbone, Broadlands, Sir Lowry's Pass.

The attention of lucerne growers is especially invited to the foregoing, for it is believed that this treatment will rejuvenate a lucerne patch which has become compacted and hard, and on which the yield shows signs of falling off, *and this without interfering with the growing crop.* The quantity which it is necessary to explode in order thoroughly to disintegrate the sub-soil under the lucerne is so small that not a plant should be disturbed, nor should a pebble or lump of earth be thrown a foot by the explosion.

The worth of this method of soil treatment stands proven in America to-day, and it only remains for us to convince the South African farmer that sub-soiling with dynamite will save him as much as it has saved agriculturists in America.

Ditching with Dynamite.—We here encounter quite a different problem to that just discussed in the foregoing paragraphs, but one also of interest to a certain section of South African farmers. The question of how best to dig a ditch for drainage or irrigation purposes, at reasonable cost, is often very important, and the following method of ditch digging by dynamite may recommend itself to some of your readers.

Holes are drilled or punched along the line of the ditch at intervals of from 12 inches to 2 feet, depending upon the nature of the soil or ground, and to a depth of from 18 inches to 24 inches, depending upon the dimensions of the ditch to be formed. Into each hole is placed, say, one $1\frac{1}{4}$ inch diameter by 8 inches long cartridge of dynamite, specially compounded with a view to sensitiveness, and the hole is closed with well-tamped moist earth. It is sometimes possible to work with a string of 500 or 600 such holes. In the centre hole of a "string" is placed a double charge of explosive, primed with a suitable detonator and fuse. This centre hole is then exploded by simply lighting the fuse, and this explosion explodes all the other holes, thus in effect making several hundred feet of ditch at one blow and at very low cost. If a wide ditch is desired, two or perhaps three rows of holes may be necessary, thus:—

This method is particularly applicable in swampy land. Where the course of the ditch lies in soft rock the holes must be very close together, or even primed individually; in fact, I question the practicability of the scheme for very hard, dense rocks, and recommend it only for certain conditions of soil and moisture.

I must apologise for taking up so much of your time and space, and will urge in extenuation that I consider the subject herein dealt with of the gravest importance to all farmers. My company is doing everything possible to develop the idea and introduce it to the farming public, and it will give me pleasure to place at your disposal, or at that of any of your readers, any information within my power to give.

The Protection of the Smaller Bushes on the Farm from Fire.

By C. W. Chilvers, Forester.

It is interesting to note that in A.D. 1680 the Batavian Government (who then ruled in the Cape) enacted severe laws against the indiscriminate burning of grass. These laws, however, appear to have fallen into abeyance on the Cape Colony being ceded to the British in 1806, for we find Dr. Pappe† in 1854 denouncing the yearly burning of grass on the mountains "whereby not only a large quantity of timber was destroyed, but that by so doing the supply of water was greatly diminished."

This indiscriminate burning of grass still continues, and unless checked will end in South Africa becoming a dry, barren country unfit for human occupation.

Almost all the smaller bushes are situated at the head of streams, and consequently every bush so situated—even the smallest of only a few square yards in extent—is worth all the protection it can have, for it will be found in most instances that if the bush is destroyed the stream will eventually dry up.

Hitherto this has not received the attention it demands, and people are often heard to say that no harm is done if the small bush does get burnt out, as it has no value, there being neither timber nor firewood in it, and so forth. This is said in spite of the generally well-known fact that South Africa has been gradually drying up for many years, and is still doing so. This is not surprising, considering that the area now under high timber forest is only about half of what it was prior to white occupation.‡

It may surprise some of these people to learn that a ton of veld hay contains about 50 lb. of sulphate of ammonia (a valuable nitrogenous manure), and as a ton of hay is a fair average yield per acre, the amount annually volatized and driven off as smoke in these veld fires must be enormous.§

In dealing with the protection of these small bushes, it will be noticed that in almost every case they are partially or entirely surrounded by a belt of rank grass and herbs, often eight feet and over in height. The soil under this rank growth retains a considerable amount of moisture, long after the surrounding veld is dry and parched, and it would be found that even those streams which eventually dry up towards the end of winter would run longer if this rank growth was not burnt off.

To protect these small bushes and streams then it is necessary that the natural protection afforded by the rank growth around them should not be destroyed, and this can often be effected by ploughing furrows

* Local term for indigenous forest. † Dr. Pappe in his "Silva Capensis."
‡ Sim's "Forest Flora of Cape Colony." § Holmes : Rhodesia.

and making a fire guard fifteen or more yards wide outside the rank growth. The shorter grass between the furrows can then be burnt off in the early winter every year. Furrows made through the rank growth are not very effective, as they so soon become overgrown, consequently where several bushes are connected together by such growth, it would be better to treat the whole as one bush.

It is needless to say that fire guards to be effective must be thoroughly burnt when the grass is sufficiently dry to burn quite clean, otherwise if a fire once gets into the stubble left after premature burning, it is almost impossible to control it.

Where it is found imperative (owing to the danger from incendiaries and other irresponsible persons) to burn off the rank growth, this can be done every *alternate* year towards the end of summer, if reasonable care be taken that it is done in the afternoon, and when there is no wind to drive the flames into the edge of the bush; for it must be remembered that the scorching and burning of the leaves of shrubs and trees does far more harm than is generally known, and that years are required to make good the damage done in a few minutes. This will be better understood if it is realized that it is through the leaves that plants breathe.

Further, it will often be found that if this rank growth be carefully protected, seedlings of forest trees will be found gradually forcing their way through, and in time the area under trees will be increased.

A better plan than burning fire guards, where practicable, would be to plough a belt fifteen or more yards wide (the lower slopes should be as wide as possible) and sow this with frost-resisting grasses such as *Phalaris bulbosa*. Stock would keep this short, and the risk of fire spreading to the bush would be very small.

A good fire-resisting tree is *Buddleia salviaefolia*, sage bush or saliehout. This, though burnt to the ground will generally shoot out again the next season. It grows rapidly, and with its dense foliage soon forms a good shelter. If given a little protection by hoeing round the roots, it will soon form as good a fire belt as can be obtained.

One of the best fire-resisting exotics is *Acacia melanoxylon* (blackwood).

Pernicious Scale Notes.

SINCE the "Notes" published in the *Agricultural Journal* for February were written, the occurrences of the pernicious scale below listed have come to light:—

Pretoria North.—1 centre with 2 infested trees on 1 premises.
Johannesburg.—1 centre with 2 infested plants on 1 premises.
Cullinan.—4 centres with 72 infested trees on 9 premises.
Boksburg.—2 centres with 21 infested trees on 2 premises.
Witbank (near).—1 centre with 76 infested trees on a farm.
Balmoral (near).—1 centre with 119 infested trees on a farm.
Middelburg (near).—1 centre with 1 or more infested trees on a farm.
Amersfoort.—1 centre with about 110 infested trees on 4 premises.
Kroonstad, O.F.S. (near).—1 centre with 7 infested trees on 1 premises.
Kroonstad, O.F.S.—1 centre with 162 infested trees in Convent garden.
Maritzburg, Natal.—1 centre with about 50 infested trees on 2 premises.
Hilton Road, Natal.—1 centre with 2 infested trees on 1 premises.
Vryheid, Natal.—2 centres with many infested trees on 4 premises.
Utrecht, Natal.—1 centre with 12 infested trees on 1 premises.
Newcastle, Natal.—1 centre with 1 infested tree on 1 premises.
Dundee, Natal.—1 centre with 1 infested tree on 1 premises.

The cases at Johannesburg, Hilton Road, Newcastle, Dundee, and one of those at Boksburg all appeared to be confined to one or two small plants, and by the prompt destruction of these the occurrences are thought to have been blotted out. Only one scale was found on the one tree at Dundee, and there is some doubt that this one was pernicious scale, but the tree was nevertheless destroyed.

The inspection of the chief nurseries of the Union and of the easily traceable sales from the two nurseries in which the scale occurred was practically completed in March, and all but one of the temporary inspectors were then retrenched. The inspection since has been chiefly of small sales in outlying districts. The inspection of the nurseries failed to disclose any of them to be infested other than the two reported previously. It is now deemed as safe for the public to deal with these nurseries as with any others. They are those of James Clark, Pretoria, and of D. A. English & Co., Pietermaritzburg.

Were the Government to decide to undertake the absolute eradication of the pest it would be necessary to extend the inspection to include numerous sales of plants by nurserymen who made purchases

of small lots of plants from the infested nurseries, and who cannot now state to whom the plants were sold. And it would further be necessary to look up railway consignments from Pretoria and Pietermaritzburg, as shown by the railway records, of what might possibly be infested trees; and also to search for and find some hundreds of slightly suspected trees from the Natal nursery that were disposed of by auction to unrecorded buyers in a number of towns. The Government has not yet publicly announced whether or not the attempt at eradication will be resumed, and in view of the enormous trouble and considerable expense involved in having the inspection extended to embrace the premises which the pest may have reached in any one of the manners indicated, attention to those possible channels of spread is in abeyance. It is unlikely, however, that many occurrences have failed to come to light through the inspection that has taken place.

The Transvaal occurrences noted above, and also the minor one at Kroonstad, Orange Free State, and the one at Utrecht, Natal, trace to the Pretoria nursery. The larger outbreak at Kroonstad probably started with trees purchased at an auction sale, and the Natal nursery is suspected of having been the source of this outbreak. The infested trees that were found at Hilton Road have not yet been traced to their nursery source. They appeared to be six or more years old, but had been brought by an Indian servant to where they were found only about a year before from some distant locality. The other Natal outbreaks probably all trace to the Natal nursery, inasmuch as trees from that nursery were planted on the central premises involved.

It is very satisfactory to be able to record that very few occurrences trace to the Natal nursery. A good business was done by that nursery with Transvaal and Orange Free State parties, and in addition to the large number of trees sold direct to purchasers, some thousands were sold by auction in small lots in Heidelberg, Krugersdorp, Kroonstad, Harrismith, Bloemfontein, Heilbron, and other towns during the period the scale may be supposed to have been in the nursery. But only two occurrences outside of Natal appear to trace to the nursery—the one of two trees at Rayton, mentioned in the February *Journal*, and the Kroonstad outbreak alluded to above as perhaps tracing to an auction purchase. These facts should help much to assure the public of the safety of dealing with the nursery. The slight infestations that were found on the premises were at once burned out, and no sales will be made this season from the immediate vicinity of where they occurred. A number of permanent trees that stood near have been sacrificed as a further precaution, although a prolonged inspection of them failed to reveal any indication of the pest. As a still further precaution a re-inspection of the stock by a particularly reliable inspector will be carried out before or as the trees are sold, and the customary fumigation of out-going stock will all be under the supervision of this official.

ACTION IN NATAL.

Learning that the Government was unlikely to attempt the extermination of the scale, the newly-formed Natal Nurserymen's Association arranged privately early in the present month for effective eradicative measures in connection with the single infested centre at Pietermaritzburg. Every plant which was stated by the Natal Entomologist to be under suspicion was removed and burned, including

upwards of one hundred fruit trees (nearly all in bearing) and several hundred feet of privet hedge. So far as is known no pernicious scale now remains in Pietermaritzburg or its vicinity.

The Natal Entomologist is also striving hard to secure the extermination of the insect wherever else it occurs in his Province. He reports that the infested trees at Moorleigh (see the February *Journal*) have been destroyed by their owners and that the surrounding trees will be sprayed as he directs. The infested trees in the smaller of the Vryheid occurrences, six in number, were destroyed by him with the owner's consent as soon as their condition was discovered, and it is understood that the infested fruit trees in the three gardens involved in the other Vryheid outbreaks were destroyed during the past week. In the last case the local magistrate is actively co-operating with the Natal Entomologist in arranging with the owners for the removal of the trees without any expense to the Government for compensation.

South African "Fertile-Worker Bees.'

By G. W. Onions.

In the *Agricultural Journal* of November, 1909, an announcement was made of my discovery that laying workers of the native honey-bee are more common than is generally supposed, and that their eggs usually give rise to workers and will produce queens.

Since this statement appeared sufficient time has elapsed for observant beemen to have put it to the test, and some no doubt who have been induced to investigate the subject have obtained conclusive evidence for themselves. A detailed account, therefore, of the observations and experiments which led to these conclusions is now more likely to meet with due appreciation. The first part of this article dealing with the subject was prepared for insertion in the *Journal* in October, 1909, the publication of which it was thought advisable to defer for a time.

"Bee parthenogenesis in the production of drones, and drones only, is regarded as universally true. It may be, however, that the ability to produce males only is but a modified form of parthenogenesis peculiar to the few varieties of bees that have come under scientific observation in this connection, for the rule as understood in its application to German and Ligurian bees does not appear to be altogether without exceptions. Instances have been reported from time to time in the various bee journals of the unaccountable presence of queen cells in queenless colonies, and the reason usually assigned for this, namely, that bees probably purloin eggs from other hives, is far from being a satisfactory one. With African bees, on the other hand, the production of females without male impregnation (i.e. impregnation by a drone) appears to be the rule to which male development is the exception.

"As a practical beekeeper and queen breeder who has always endeavoured to verify in his own experience the facts and theories of bee culture, I submit the following observations and conclusions regarding the faults and faculties of African laying workers:—

"One day in 1901 I found the queen of one of my colonies on the outside of the hive surrounded by an interested group of three or four drones. This was a young queen, and the reason for her being found in this unusual situation was the fact that I had clipped her wings a day or two previously under the impression that she had mated, whereas she had not, though the presence in the hive of hundreds of eggs fully justified my mistake. This was the beginning of my acquaintance with laying workers, but I need hardly say that before I was able to realize how matters stood I had begun to find out that our bees differ from those described in bee literature. One of the doctrines of bee culture is that bees will not tolerate a fertile worker while a laying queen is in the hive, except in rare instances. With

African bees, however, in contrast to European races, laying workers are always present, if we may judge from the facts (1) that in queen-right colonies the old queen cell bases almost invariably contain many workers' eggs (a condition supposed to be a sign of queenlessness), and (2) that workers' eggs have frequently been found in combs above a queen-excluder with a laying queen below.

"But to give an instance of the assiduity of these little pests of the apiary, I will describe a particular experience:—I removed a frame of bees and the queen from one of my Golden Italian colonies to an observation hive for exhibition at Rosebank Show. The following day I returned the frame to its hive, taking the precaution to protect the queen with a pipe-cover cage. Next day I liberated the queen, and she was well received; but on looking over the combs for queen cells I found an African laying worker. That she was a pseudo queen was evidenced by her demeanour and by the peculiar attentions of the surrounding bees towards her. It should be noted that this Italian colony occupied a separate part of the apiary, and was well out of the range of flight of young African bees in orientation, that it was at a time when the honey flow had ceased and there was a strong tendency for bees to rob, and that Italian bees guard their entrances too well to let ordinary strange bees in. This laying worker was positively the only African bee present in the hive. Perhaps I should remark that the contrast is so striking between the little dark African bee and the larger Golden Italian that an African is conspicuous amongst 'goldens.' I mention this case because there were no other queenless bees in the apiary at the time, but where a laying worker colony (or queen-right African colony for that matter) exists they are apt to throw laying workers into other hives and thus become a menace to the welfare of the apiary and a fatal obstacle to queen-rearing operations.

"It is no doubt a fact that bees on the 'let alone' policy seldom allow the laying worker tendency to predominate, but owing to the natural irritability of the African bees the least amount of handling necessary to artificial methods is apt to get them demoralized. For instance, if a hive swarms and it is left absolutely untouched it will generally succeed in having a laying queen in due time, but even when left entirely alone I frequently find the dead queen outside the hive about ten days after hatching. Supposing that we divide the colony into nuclei, we may be almost sure of finding the dead queens about mating time. Two seasons ago I tried hard to get some queens reared from imported stock. I succeeded in raising several dozens of fine queens, and with very few exceptions got them safely introduced to nuclei, but the majority of them were found dead in front of the hives at about the time when they should have commenced to lay. I have given up trying to get queens mated in African bees, and am careful not to have any laying-worker hive about when queen rearing is proceeding.

"I will here describe an experiment. On 27th September I prepared two baby nuclei, which I will call A and B. They were each composed of about 400 African bees on three 5 in. by 4 in. frames containing honey and pollen. The same evening a one-day-old English virgin was given to each. By 18th October both these nuclei had eggs and brood, but neither queen had mated. I then prepared another 'baby' (C), composed of English bees, took the queen from B and gave it to C. By the 21st she began to lay. On the 24th

A's queen was still unfertilized, and I gave her also to a nucleus of English bees; by the 27th she was laying. Now, I must explain that my strain of English bees are usually slow in mating, but why was there the extra long delay in this case when everything was apparently favourable? May it not have been on account of lack of inducement from the bees? If so, was it not because these Africans were too well satisfied with their laying workers? The answer to this question may perhaps be found in the sequel to this case, which will appear when I refer to these nuclei again, as I will do later on. If the queen is removed from a hive, laying workers' eggs will appear in two or three days, but if deprived of brood as well they will be found in twenty-four hours. These laying workers appear in great numbers. I once counted over a dozen of them in the act of laying at the same moment. This point is further evinced by the large numbers of eggs produced by them. I should say that four is about the average number per occupied cell in a colony of average strength, and I have frequently found as many in the same hive as would, if singled out, fill three or four sides of a Hoffman frame. In order to prove that worker bees actually do lay eggs I deprived bees of queen and brood and confined them to the hive with wire gauze; though they did not begin to lay so soon in confinement as they otherwise would, eggs were found within a week.

"Another dogma of bee science is that eggs laid by laying workers invariably produce drones—this rule does not apply to African bees. Obviously, African bee-laid eggs either do or do not hatch! This was how the matter presented itself to me at the commencement of my bee-keeping experience, until now, for the first time, I had occasion to form my own conjectures. I had endeavoured to verify the statement that they invariably hatch drones, but all I can say with certainty is that occasionally a drone is produced in laying-worker hives. African workers' eggs, then, not only do not invariably hatch drones, but, broadly speaking, it may be said of them that they do not produce drones.

"Bee-laid eggs do hatch, however, and in order to prove this I hived queenless bees on clean combs, where they produced eggs and hatched them in segregation. It is a characteristic of 'fertile workers' that they lay several eggs in a single cell, and therefore a common sight to see four or five little larvae lying huddled together until, as they grow larger, all but one are removed by the bees. The majority of bee-laid eggs never hatch, and such as do are usually selected haphazard; for, as a rule, the nursing instinct is deficient in laying-worker hives, though I have seen laying workers' broods that none but an expert would have known from the work of a queen. I have had scores of laying worker colonies in my experience, and every one of them produced eggs which hatched, the bees developing from them being almost invariably workers. The conclusion may easily be drawn that if worker-laid eggs develop worker bees they must also be capable of producing queens. Practical observation has borne out in scores of instances in my experience the correctness of this deduction.

"On the 14th November, 1908, I took a weak laying-worker stock that had reared two or three worker-produced queens in succession and destroyed them, putting them into another hive fitted with shallow frames containing starters only and a feeder. On the 16th they had worker comb built which contained eggs. On the 27th they had

capped worker brood and four queen cells. On 9th December three of the queens were picked up near the hive, while the other was found in safety within. I may mention the fact that no drone comb had been built. African queenless bees, if they build comb at all, invariably build worker comb.*

"On 10th September I formed a strong nucleus (No. 49) of queenless and broodless bees on empty combs, and one—a nice, complete new comb—I marked. Next day I inserted a strip of comb containing Golden Italian eggs and larvae, queen cells were built, caged as soon as capped, and all hatched. They were removed from the hive on the 23rd. By this time they had a quantity of workers' eggs, some capped brood, and an open queen cell on the fourth frame from the one where the queens had been reared. This cell afterwards hatched an African queen. On the same date (23rd September) I removed another hive (No. 45), a strong, double-storeyed hive, to a new stand. I then removed the upper part of the hive (which was separated from the lower by a queen-excluder) containing honey, capped brood, and one frame of advanced open brood, back to its former stand. On the 25th I examined them and found six queen cells on the open brood comb. The cells contained larvae too large for making good queens, there being no very young larvae anywhere that I could see. I then extracted the larvae from all the queen cells and grafted them with newly-hatched larvae from the marked frame in No. 49, which by this time was filled throughout with workers' eggs and larvae, taking care to select the smallest I could find, where they had hatched together. I took four of them from a single cell. I watched the larvae develop, examining them frequently during the first two days to see that the bees did not exchange them for others, and satisfied myself that they did not. Four out of the six cells were completed and hatched queens. Now to return to the baby nucleus (A) before mentioned. It is to-day, the 29th October, hatching worker bees and has just started a queen cell."

At this point the account ends, but I find on referring to my notes on this case that the two English queens both proved to be drone layers, confirming my statement that they had not mated. The nuclei A and B were united and left to their fate. They did not succeed in maturing their queen cell, which was not to be expected of so few bees, and soon disappeared. A laying-worker colony seldom succeeds in getting back to a normal condition, notwithstanding that it can raise workers and queens: for the rule is that, according to its strength at the beginning of fertile-worker control, and probably through the influence of other factors as well—such as season, pasturage, etc.—it will last for several weeks or months and gradually dwindle down to the last bee, or, as often happens, the last remaining handful of bees will desert the hive and form a little cluster on some hedge or bush near by and there perish. But the exception to the rule, i.e. for them to succeed in getting a laying-worker-produced queen, is impossible while active laying workers are in full possession, and can only occur when a colony, strong at the commencement of laying worker control, after raising several queens in succession and destroying them has managed to outlive the laying-worker faculty while still strong enough

* According to Dr. C. C. Miller, "Queenless bees, if they build comb at all, invariably build drone-comb."

to breed a queen, or before their latest attempt was hatched. Without any record of the number of queens which I have known to have been bred in long-queenless bees—a fact which cannot be accounted for by any known theory of bee culture—I venture to say that there would be at least a hundred, and yet I only know positively of three cases in which these bees ultimately mated a queen of their own making. Queens from workers' eggs are comparatively small and inferior looking. This may only be due to poor feeding. In the three cases just mentioned they were superseded in the same season.

The "fertile-worker" energy of a colony weakens in time, and, in some cases, almost disappears. There are many probable causes for this, I might mention, but I will merely state the fact as I have found it. *The falling off of laying-worker activity is accompanied by the appearance of a few diminutive males.* I will here mention that, incidentally, the restriction of drone comb with foundation imported or made on imported machines does not repress the laying of drone eggs by the queen, as the foundation suited to European bees results in cells measuring one-fifth larger in diameter between parallel sides than cells built naturally by African bees, and are frequently used for raising drones in the absence of drone comb. The size of the cells may sufficiently account for the smallness of the drones reared in them, but does not check the inclination of a queen to lay drone eggs, nor does it influence the sex of laying-worker progeny produced in them. It is remarkable that laying-worker colonies, in all their efforts to raise queens, do not build their queen cells upon old cups. If any such are in the hive they are sure to be packed with eggs which never seem to hatch, nor are their queen cells ever specially prepared, as in the case of swarming. Invariably their queen cells are built over young larvae in worker cells on the surface of the comb. Any condition which impels a colony to construct queen cells, as the removal or caging of the queen, failure of the queen through age or debility to lay eggs in sufficient number, or congestion of the hive with stores or brood, is certain to be accompanied by the appearance of active laying workers. The following instances, taken from my record book, will serve to illustrate some of the foregoing conclusions.

History of nucleus No. 47: A box hive of bees purchased in the near vicinity of my out apiary was transferred to a frame hive and left on the spot. Later, it was removed to the apiary enclosure, and a frame, containing mostly advanced brood, in a nucleus hive was left in its place for returning bees. This nucleus (No. 47) was brought to my home apiary a week later. At this time it was examined, and a couple of queen cells were found and destroyed. Workers' eggs were in evidence, and another nucleus containing a laying queen protected with a pipe-cover cage was united to it. After the queen was with due caution released, she was killed by the bees. I found her outside the hive. A week later a queen cell was started which, in due time, hatched a queen. Ten days later this queen was killed and thrown out; she had not mated as I found on dissection. Eight days later (this was 18th September) there were queen cells again. On the 22nd I destroyed the queen cells and united the nucleus (No. 47) with No. 50. No. 50 had been brought in from my out apiary on 15th September. The following day I had removed the queen and given the bees a frame containing partly drawn new

comb with hatching eggs from an imported English queen and twelve cell cups grafted with larvae from the same comb. Eleven of the grafted cells had been accepted and eight built on the comb. On the 22nd I caged all these queen cells and united nucleus No. 47, as before stated. By 27th September all the queens were hatched, and on that day I found another queen cell started on the comb of English brood. I then divided the bees, leaving the caged queens with No. 50 and taking the other half, which I again called No. 47, with the new queen cell to another stand. All the young queens were placed in nuclei between the 28th and 30th. On the 30th, also, No. 47's queen cell was capped. On 1st October No. 50 was found to have three queen cells started over their own worker larvae. All of these queen cells hatched queens. The queen cell in No. 47, on the frame of English brood, hatched an African queen. There were no drones raised in either of these hives.

Another case: An Italian queen in a small nucleus of her own bees was given hatching brood of African bees and fed regularly. Although not twelve months' old, and apparently a fine queen and laying, she was picked up dead outside the hive three weeks after giving the first African brood. The cause of this is apparent in the light of my experience with imported queens, but is not relevant to the subject in hand. Looking into the hive at this time, I found three queen cells just ready for capping. These cells were extended worker cells, and there was unmistakable evidence of laying workers on one of the other combs. The two cells were caged as soon as capped, and immediately more cells were started on the comb occupied by laying workers. These latter cells hatched African queens, the first three resulting in Italians. African worker bees, but no drones, were reared from the laying-worker eggs.

Having several Italian queens in my apiary has afforded me much interesting experience, reference to which will only be made for the sake of elucidating my subject. I might here mention one experiment suggested by an incident given in the early part of this account. An African laying worker, introduced as a queen to a few Italian bees, was accepted as such, and produced African worker bees.

Here is another account from my record book: On 30th November a colony having an old queen was found to be superseding. I removed the queen and part of the bees into a nucleus hive; 15th December I found a capped queen cell, and on 27th December a virgin queen, the old one still being present. There were also unmistakable signs of laying workers. I was satisfied of this, though at the time fully aware of the statement often met with in bee writings that the ovipositing of a worn-out queen may closely resemble that of a laying worker, a statement very rarely verified in African beekeeping, however, because usually the queen is superannuated by the bees before this stage is reached. But to proceed with this case. Four days later I found the old queen thrown out dead and the young one still in the hive. On 1st January she was missing. At this time I captured a laying worker and dissected it, finding the ovaries well developed and showing a number of eggs ready for laying. 3rd February I searched again for the queen without success. The capped brood in the hive then consisted of workers and a few drones, and they were running very short of stores. On 18th February the remaining bees were only sufficient to have

properly covered one side of a Hoffman frame. The brood was reduced to a small patch on either side of one comb, still hatching workers, and a few very small drones. There was also a queen cell just started and I found it necessary to feed. 26th February the bees had dwindled down to about two hundred, carefully estimated. The queen cell had been abandoned before capped and the base of it contained about twenty eggs; besides these I could only find two other eggs. There was nothing in the larvae stage, and of capped brood there were thirty-seven, all in worker cells. I lifted the cappings off all of them, six being dead, and the sex undistinguishable. Of the remainder all but three were in the nymph stage, the heads well developed, and the drones easily distinguishable from the workers. Some of each were ready to hatch. I counted fifteen workers, the rest being drones.

Here is another interesting case: A colony being unquestionably queenless, raised and destroyed three successive batches of queens, producing worker bees all the time, but no drones. I divided this hive (a ten-framed "dovetailed" hive) into three bee-tight compartments with separate entrances. Each section of bees continued egg laying, and each of them had one or more capped queen cells within a fortnight. The queens hatched and I saw them all daily until they were destroyed by the bees, between the eighth and tenth days after hatching. Worker bees were hatching continually in all compartments, but no drones appeared. I then reunited the three lots, after which they raised two other queens in succession, destroying them as before. By this time the stock had dwindled down to about one frame of bees, very few eggs could be found, and several days passed without any further attempt at queen rearing. After this I took no further notice of them, expecting them to abscond or die off quickly. But something happened which altered the fate of this lot. I had occasion to move four colonies standing in this part of the apiary, which was in danger of being swamped, to higher ground, and quite a swarm of stray bees from the moved hives found their way into my derelict. When I examined them a day later they had started a queen cell; I saw the queen after she had hatched, and the next time I looked into the hive to my great surprise found her laying.

On 12th January, a hive containing an African-mated Italian queen was taken to my out apiary. I first examined it on the 28th, after having picked up three dead queens outside the hive on that day and five on the day previous, but did not find a queen. Four times after this I examined carefully, and, again, on 26th February, without success.

There was at this time, however, a large amount of laying-worker brood and eggs scattered throughout the hive. No sign of any attempt at raising another queen could be found, although some old queen-cell cups contained clusters of eggs. Under 12th March my record reads: "Examined thoroughly for queen or queen cells; none found; nearly all brood is in the capped stage, and consists of worker brood with the exception of a couple of dozen drones. There has been very little honey coming into the apiary since this colony was brought here. No queen-right bees would raise drones under present conditions. The drones appear in a small patch of old drone comb, and a peculiarity is that the majority of these drone cells contain

workers." 14th May: "Several examinations have been made since last date, and the proportion of drone brood has gradually increased, but is confined to one frame scantily filled. There are now two capped queen cells, one built over an old cell cup, the other an entirely new cell." 21st May: "One queen cell which was put under a pipe-cover cage hatched an African queen, which was found dead. The other appears to have hatched normally. Queen could not be found. Very few bees." Here is another exception to the rule that the eggs of African workers develop females. Exception also in respect to several particulars, viz.: (1) The unusually long interval between the first attempt to re-queen and the subsequent ones; (2) the comparatively early production of males; (3) the manner of their appearance (i.e. in a small patch of old drone cells contained in the centre of a frame of worker comb, and the disorderly mixture of drones and workers, mostly workers); (4) the building of a queen cell over a previously used one; and (5) the erection of an entirely new queen cell. It should be remembered that this was a hybrid stock, and any diversity of result may have been on that account. The ability to raise workers from workers' eggs was evidently imparted to it by the cross. In respect to point (3), however, the disorderly mixture of occasional drones amongst worker larvae in drone cells added to the facts previously ascertained, that laying-worker colonies from the commencement to the end of their career never build drone comb although they build worker comb readily and that drone comb given to them fails to encourage drone production, points to a lack of incentive to raise males if not due to inability to do so in the early stage of their history. I must mention one or two very significant facts in connection with this subject. In European bees it has been thoroughly demonstrated that laying workers produce drones only, and that they do very often build queen cells, but these always contain drones which fail to develop fully. I leave the question for others to decide whether the occasional production of queens under similar conditions as sometimes occurs are genuine exceptions to the rule, or correctly attributed to the resourcefulness of the bees in stealing eggs from other hives. In African bees, when a normal queen has been removed from a hive amongst the first batch of queen cells resulting, I have often seen queen cells built over drone larvae in transition cells, and once I took a fully developed but dead drone out of a capped queen cell. But I have not met with a single instance of a drone from a laying-worker egg being reared in a queen cell found in a laying-worker hive.

It has been found possible with some strains of bees, under favourable conditions, to keep two or more queens of a certain age working together. Always keen on following up anything new relating to bees, I pursued this matter with interest and made many experiments. Well, I have found that several old queens will live peaceably together, and in the same hive two or three may manage to provide eggs enough to satisfy the bees and so avert supersedure and the laying-worker tendency, but a young blood or a queen in her prime will not endure the presence of another under any circumstances, and bees dominated by laying workers, or the laying workers themselves, will not admit a strange queen at any time. I have tried repeatedly to introduce laying queens to them by every known method, and by methods of my own, without success. As to mother

and daughter working together, I have seen several instances of this in my bee experience, but it was only a matter of days before the old queen disappeared. As to the possibility of swarms entering queenless hives, I merely state the fact that at my apiary at Retreat, during the three years when most of these observations were made, I had only one natural swarm issue from my own hives, and not a single swarm came my way although I had decoy hives out for a great part of the time. The probable reason for this is that there were very few bees in the neighbourhood, that the honey flow there is confined to two months of the year, and that the time referred to was a succession of poor seasons.

In conclusion, I wish to say with regard to the detailed instances here exampled that they are taken from records of observations and tests purposely made and preserved as being illustrative of many other similar occurrences during the twelve years of my study of bees. It must not be supposed, therefore, that these are solitary instances. Since these particular cases occurred I have dissected numbers of fertile workers. By constant practice I have acquired ease in detecting them by other signs besides the act of ovipositing, and whenever I have pronounced laying workers present I have generally managed to secure one or more of them and confirmed my convictions by dissection.

In presenting these views for the first time I have carefully refrained from introducing any theories or opinions of my own, confining my account to a plain statement of facts which observation and experience have enabled me to detect.

Salisbury, Rhodesia, March, 1912.

Loans for Erection of Cattle-Dipping Tanks.

FACILITIES FOR FARMERS.

Experience in those parts of the Union where East Coast fever has been raging has shown that one of the best methods of combating the disease is that of regular and frequent dipping of stock with a view to destroying the ticks. In the early days of the disease this fact was not so fully recognized, for the simple reason that dipping was not performed at sufficiently short intervals, with the result that the ticks were not destroyed in sufficiently large numbers to make any appreciable impression upon the advance of the disease. The advantages of frequent and regular dipping are, however, now so generally recognized that facilities have been provided to farmers by the Government for the purpose of erecting dipping tanks by means of advances out of public moneys, which advances are repayable by easy instalments and bear interest at a moderate rate. The Dipping Tanks (Advances) Act, No. 20 of 1911, provides that, whenever under any law relating to diseases of stock the Minister of Agriculture orders any person who is the owner of a holding to construct a dipping tank upon his holding, or, again, whenever any owner of a holding is desirous of constructing a dipping tank, such person may apply to the Department of Agriculture for an advance sufficient to defray the initial cost of constructing such a dipping tank (including the cost of materials and the transport thereof to the farm, as well as the cost of construction). Advances are only made in respect of dipping tanks the plans and specifications of which have been previously approved by the Department of Agriculture.

These advances bear interest at the rate of 4 per cent. per annum, and are repayable to the Department by equal yearly instalments, so calculated that the whole advance and the interest due thereon will be repaid within such period—not exceeding eight years—as the Minister of Agriculture may prescribe. The first instalment becomes due two years after the advance is made, but interest must be paid by the borrower during that period.

For the purpose of these advances, any number of holdings may be regarded as one holding provided they are contiguous to each other, and provided that their aggregate area does not exceed 3000 morgen or such greater extent as the Minister of Agriculture, having regard to the practice of the owners, may determine. This provision enables the owners of adjoining farms to club together for the purpose of erecting a common dipping tank. In such cases, of course, the owners are liable for repayment of the loan in equal proportions, with corresponding interest.

Provision is made for the registration of such advances in the Registrars of Deeds offices, and no transfer of a holding will be

possible until the amount of the advance and interest due thereon has been paid and the Registrar of Deeds has deleted from his register the note made against the holding.

The Department of Agriculture is empowered to send officers to inspect dipping tanks erected under the provisions of this Act, and should any such tanks be found to be in need of repairs, it may call upon the owner to execute such repairs, failing which the Department is empowered to carry out the repairs at its own cost and recover the amount by action in a court of law.

Should at any time instalments or interest due under the Act remain unpaid for three months after same is due, the Department of Agriculture may call upon the person liable to repay the whole advance or such portion thereof as may still be due, together with any interest due. The same course may be followed in the case of a person who has appropriated the money or material for other purposes than that for which it was advanced.

Forms of application and copies of the approved plan and specification may be obtained from Magistrates and the Department of Agriculture, Pretoria.

Notes.

Sale of Fruit Trees—Horticultural Division.

The Government Horticulturist, Transvaal, desires it to be announced that the fruit trees which were advertised for sale in the last issue have been disposed of.

Outbreaks of Animal Diseases—Correction.

In the returns of outbreaks of animal diseases for the month of February, published in the March issue, through an error the farm Breezie Brae, Vryheid, Natal, was shown as being infected with East Coast fever. The Principal Veterinary Surgeon states that the name should have been Lot A.11 of Dubblerecht.

Sale of Tobacco, Western Province.

With reference to the note on the above which appeared in the March issue, the Secretary of the Capetown Chamber of Commerce now notifies that the date of the sale has been changed from the 20th May to the 3rd June. The sale will take place, as previously stated, at Mr. Marcus' auction mart, 30 Burg Street, Capetown, commencing at 10.15 a.m.

Foot-and-Mouth Disease in Great Britain.

In view of the fact that foot-and-mouth disease (*Epizootic aphtha*) no longer exists in Great Britain, a Proclamation has been issued by His Excellency the Governor-General cancelling and repealing Proclamations Nos. 206 and 243 of 1911 in so far as they prohibit the importation into the Union of South Africa of cattle, sheep, goats, and pigs from Great Britain.

Immunization of Mules.

It is notified that the Minister of Agriculture has been pleased to approve of the enforcement of the following amended conditions in regard to the inoculation of mules against horse-sickness:—The Government veterinary surgeons will be prepared to undertake the immunization of mules against horse-sickness in the districts in the Provinces in which they are stationed at the undermentioned rates and subject to the following conditions: *With insurance.*—On payment of a fee for each mule immunized, in accordance with the scale shown in the schedule hereto, the Government undertakes to pay in compensation for any animal dying as a result of inoculation whilst under treatment according to the valuation fixed by the Government veterinary surgeon (unless the owner desires to have his mule insured for a sum below the market value) an amount not exceeding £30 and not less

than £5 per animal; provided the Government veterinary surgeon certifies that the conditions imposed by him have been duly complied with. Any animal intended for inoculation may, at the discretion of the Government veterinary surgeon, be tested with mallein before being inoculated against horse-sickness. Government Notices Nos. 908 and 970 of 1910 are superseded and cancelled.

SCALE OF FEES.

Minimum—

For a Mule valued at	Fees (including cost of Serum and Insurance Premium).
£5	£0 10 0
10	0 15 0
15	1 0 0
20	1 5 0
25	1 10 0
Maximum—	
£30	£1 15 0

Export of Hay, etc., to Great Britain.

It is notified that a cablegram has been received from the High Commissioner for the Union in London stating that an order was issued by the Board of Agriculture on the 21st March to the effect that hay, straw, and chaff shipped direct from South Africa will in future be admitted into Great Britain without restriction or licence, whether the consignments are shipped in vessels calling only at the ports of Las Palmas, Teneriffe, or Madeira, or not.

Spilt Milk--A Useful Tip.

" Vet Kol " writes: The only way to prevent milk, or cream, either fresh or sour, leaving stains when spilt or splashed upon one's clothing is to dash over it, *immediately*, plenty of cold water, and thus wash it away before it has had time to soak in. The mere wetting that results is quite a minor evil when compared with a number of bad, permanent stains. Any one who has continually to handle quantities of milk will find this a really useful hint.

A Successful Experiment with Teff Grass.

The Government Botanist, Transvaal, has received the following letter from Mr. C. R. Gardner, Johannesburg:—" At the request of my son, . . . I forwarded to you a few days ago two samples of teff grass, grown on Birmingham Farm, Honingspruit, Orange Free State. I bought this farm for my son seven months ago, and judging from the yields of teff, mealies, and manna hay it would appear as if there was some good soil on the farm. The 18-acre field (old land) we expect will yield nearly 2½ tons to the acre, whilst the new land, 7 acres, should give, on a low estimate, 2 tons to the acre. There is a further 25 acres, sown in January (too late), which may give us 1 ton to the acre. My son tells me that you recommended him several times to grow teff, and he is delighted with the result. The samples shown you were sown on the 14th and 20th November respectively,

and therefore withstood two fairly long periods of drought before the heavy rains fell. Our neighbours all agree in saying that they have never seen such a magnificent crop in that district."

Natal Agricultural Union.

The annual conference of the Natal Agricultural Union was held at Pietermaritzburg on the 23rd, 24th, and 25th April. The meeting was a very successful one in most directions, and some useful work was done. Early in the proceedings the usual presidential address was read, in the course of which Mr. Mitchell gave an interesting review of the agricultural year in Natal. He said:—"The year that has just closed has been in many ways an abnormal one. In the matter of rainfall, parts of the Province have had far below the average; others have come out well, and I am informed that Cedara has had the wettest season in its history. Taking one place with another, the crops have not been good, and this especially applies to maize, but though the average return per acre has been low, yet the acreage of late years has been so increased that the total production has more than met the South African requirements. So long as the South African market absorbed all our crops, a shortage of returns gave increased prices, which helped to bring the balance even. Now we have reached the exporting stage we find, as a general rule, that our local prices are governed by prices in London, whether our returns are large or small. Fortunately for us the London prices have ruled fairly high during the last season, or some of our farmers would have been hit very hard. Of late years there has been considerable agricultural development over the whole of South Africa; the output of maize is now well beyond the local demand and is rapidly increasing. And what is true of maize is true also of most of our crops, fruit included

"There are still some directions in which the South African demand considerably exceeds the supply, but these are special cases with special circumstances. Taking the outlook as a whole, the farmer to-day is faced with the fact that his old local markets are being closed to him through over-production, and that he must turn his attention to the markets across the seas. This new condition of things has to be met. That the Natal farmer will meet it I have not the slightest doubt. The men who have fought through all the plagues, depressions, and difficulties of the last few years will, I am sure, meet this new situation also. When East Coast fever stood threateningly over us it looked as if the country must be overwhelmed, yet many a farmer will confess to-day that more blessings than curses followed it, and that stock farming is on a much firmer basis now than it was before that dread visitation. So I believe we shall find with this new condition of things. The position bristles with difficulties and much hard work lies before us, but once we have adapted ourselves to producing for the world market instead of the South African one we shall be in a far better position than we are to-day. At present, however, most of the difficulties are before us, not behind. To enter the oversea markets and compete on level terms with older and better-equipped countries will need all the brains we can bring to bear on the subject, and all the help that can be reasonably expected from Government."

Pernicious Scale in Natal.

Included in the presidential address was a lengthy letter from the Natal Entomologist, Mr. Claude Fuller, dealing with the question of the eradication of pernicious scale. After discussing the disease generally, Mr. Fuller went on to say:—"The actual introduction of the pest in question into Natal is very obscure, but such evidence as can be collected shows it to have been introduced about 1905, or perhaps earlier. Its destruction in the Province is not yet fully worked out, but a large amount of data has been secured, and this all goes to show that the places where it does occur are few and far between. The centre of distribution has, I believe, been accurately located and eliminated. The stream—a mere dribble apparently—has been stemmed at its fountain head, and such new infestations as do occur will be spread from where the pest is now located. The work so far done towards ascertaining the extent of the pest extends to an examination of our deciduous nurseries, an inspection of the gardens of Maritzburg and its suburbs, all of those of Vryheid, Utrecht, Newcastle, and Dundee, many of those of Richmond, and part of Ladysmith. The outlying farms to which there is a possibility that scale has been carried from the distributing centre have been located, but so far it is impracticable to visit the majority of them. However, it may be said of these that, if the law of average holds good at all, the scale has not been carried to more than 1 per cent."

East Coast Fever Dipping Tanks.

There was a long discussion on the subject of dipping tanks, relative to which there were several motions on the agenda paper. The two most important resolutions passed were the following, at the instance of the Gourton Farmers' Association and the Klip River Agricultural Society respectively: (1) "This Conference impresses upon the Government the urgent necessity for the immediate construction of dipping tanks in all native locations and mission reserves, and unoccupied farms owned by Europeans in this Province and Zululand, such work to be completed before the end of the present winter; the tanks to be placed under proper European supervision; and that laws relative to the cleansing of cattle now in force in this Province be strictly carried out and made to apply to Europeans and natives equally." (2) "That this union urges the Union Government to enforce compulsory dipping of cattle in all districts, particularly those districts where outbreaks have occurred." The latter resolution was carried almost unanimously.

The Future of Allerton Laboratory, Natal.

Dr. Theiler, Acting Director of Veterinary Research, who was present at the conference, addressed the meeting in connection with the future of the Government Bacteriological Laboratory at Allerton, Maritzburg (as is generally known, Mr. H. Watkins-Pitchford, Government Bacteriologist for Natal, has resigned his position). He said he had come down to take over the Laboratory, which it was his intention to keep on. There was so much work to be done in Natal

that the large Laboratory in Pretoria could not cope with the work, and they were too far away from the centres of disease. Whenever any information was required, farmers would proceed as hitherto. Mr. Shilston would be in charge. The preparation of vaccine and sera and such materials would be done at Pretoria in future, with the result that the Allerton staff would have more time for original investigation work. Dr. Theiler proceeded to say that it was his intention to keep in close touch with the Natal farmers, as his experience showed that this was necessary in carrying on investigational work.

Stijfziekte in Natal.

Replying to a question *re* stijfziekte, Dr. Theiler said he was unfortunately not in a position at the present time to state what was the cause of the form of the disease found in Natal. He knew that in the Transvaal the form of stijfziekte found there was due to a certain plant, *Crotolaria Burkeana*, but he was not sure yet whether this was the case in Natal. He also pointed out that the stijfziekte of the Transvaal was different from the disease going by the same name in the Cape Province, and it was just possible that what was known as stijfziekte in Natal was different again from the other two forms. He hoped to be able to experiment with the disease at Allerton shortly; if not at Allerton, at a farm where an outbreak had occurred.

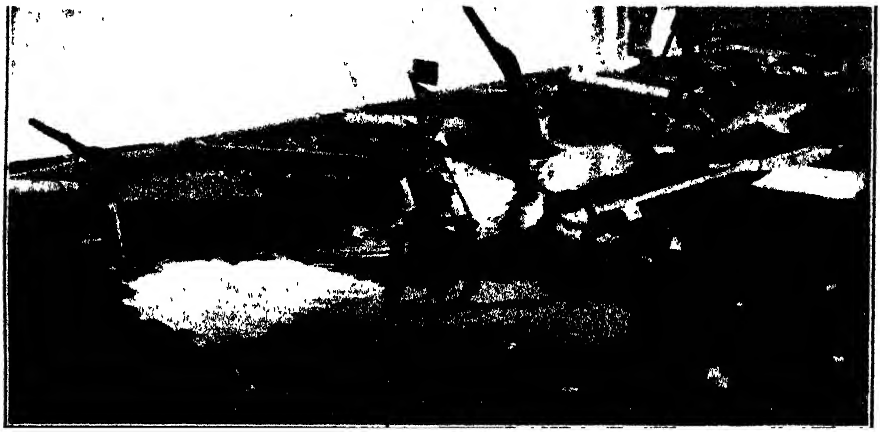
East Coast Fever.

Dr. Theiler also offered a few remarks on East Coast fever eradication. He said that when they first experimented in connection with East Coast fever they were unable to transmit the disease artificially from a sick animal to a healthy one. Now, however, they had succeeded in doing this. Inoculation had been introduced into East Griqualand by Mr. Gray, the Principal Veterinary Surgeon, after all other means had failed. The loss in connection with this treatment amounted to from 25 to 30 per cent. Inoculation, however, was not the right means of fighting East Coast fever; it was only to be resorted to in case of emergency. For by inoculation the disease is maintained, and the object of the Department was, of course, to eradicate the disease. Even if 100 per cent. of the animals treated were saved, inoculation would still not be the right method of combating East Coast fever. In the Transvaal the disease was of no consequence now; but if East Coast fever should again break out, the authorities would advise the adoption of the Natal method, namely, dipping. Dipping was the only right way of dealing with the disease. In this connection Dr. Theiler spoke in terms of praise of the example which the Natal farmers were setting; and he had no doubt that the farmers of that Province were showing the rest of South Africa what could be done in the direction of eradicating East Coast fever.

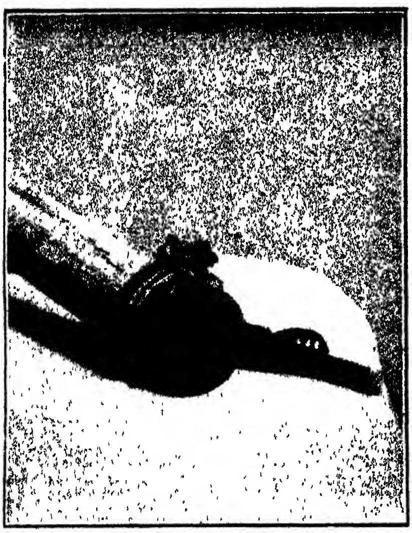
Cradock Field Trials, 1912—Dam Valves.

The following is the judges' report on the field trials of dam valves held in connection with the Cradock Agricultural Show in March:— The judges are very pleased with the exhibition of dam valves, several

of which are of high order of merit. There are eight exhibits in all. The judges are unanimous in awarding the prize to C. K. Hall, Middelburg, Cape Province, for his metal valve, leather washered, which works easily in opening and closing, and is arranged to be



Names of Exhibitors from left to right: P. J. Koch, Richmond; Kilfoil, Bedford: C. K. Hall, Middelburg; J. P. Grobbelaar, Cradock: N. F. Haarhoff, Witmoss; F. Ward, Steytlerville; J. Brider, Middelburg: and A. E. Smith, Grahamstown, in front.



Showing valve closed.

Showing valve open.

C. K. Hall, Middelburg (C.P.). Winner of First Prize, £25, at Cradock Field Trial, 1912.

padlocked. Price 10s. Next in order of merit is J. Brider, Middelburg, Cape Province, for his all-metal leather-washered valve; very similar in design, but not arranged to be locked. Price a little higher, 12s. 6d. Mr. Kilfoil, of Bedford, shows a long lever metal valve with wood stopper, leather washered, and fitted with a particularly simple arrangement for taking up wear. Price 30s.; high by comparison.

N. F. Haarhoff, Witmoss, shows an all-metal valve, leather washered, with screw lever capable of working easily at a high pressure. Very strong and good value for the money. Price 25s. P. J. Kock, Richmond, shows an all-metal valve, leather washered, somewhat inconvenient for closing. Price 7s. 6d. Fred. Ward, Steytlerville, shows an all-metal valve, leather washered. Not so simple as others, but works well. Price 20s. I. P. Grobbelaar, Cradock, shows a wood lever (sludge pattern) valve, leather washered. Easily adjusted. We consider wood will wear unduly, crack, and warp. A similar pattern, brass-faced, would find a good market, we think. Price 20s.; any size. A. E. Smith, Grahamstown, shows the old cone-shaped metal valve, leather washered, and fitting with a pipe "bend" and held there by gravity and water pressure. Suitable for fixing inside dams only. This is the principle generally employed outside "water-towers" in large reservoirs. No means of testing same. Price 45s.

All the other seven valves were tested under a pressure of 20 feet depth of water, arranged by means of a "stand pipe" fixed to the town "main." The management reflects great credit on the indefatigable honorary secretary, Mr. Geo. H. Byrnes, and Mr. Wilfred Gilfillan, the field steward, who arranged and superintended the practical test which worked admirably. A condition of the trial advertised was that valves had to be of a size suitable for 3-inch piping, so that prices could be easily compared.

Spaying Cows.

In reply to an inquiry from a correspondent who desires particulars as to the spaying of cows (ovariotomy)—whether it is attended with much risk, whether it is possible for an ordinary farmer to perform the operation, and whether it is possible to operate upon a cow in calf—the Senior Veterinary Surgeon, Transvaal, writes:—The operation can be performed in two ways, namely, by the vagina or by the flank. I do not think an ordinary farmer should attempt the operation, and in my opinion an in-calf cow should not be operated upon.

Vaginal Ovariotomy in the Cow.

Objects.—Increasing the fat or milk producing qualities, and the cure of nymphomania.

Instruments.—Colin's scalpel, vaginal dilator, Miles' spaying shears, spaying ecraseur.

Technic.—Confine the cow in the standing position in the stocks, secure the head firmly, and pass two boards beneath the abdomen and sternum to prevent lying down, and a rope over the middle of the back to prevent arching of the spinal column and straining. Wash and disinfect the tail and the perineum and flush out the vagina with a .5 per cent. solution of carbolic acid or lysol at a temperature of about 100 deg. F. Insert the vaginal dilator with one hand and push the prolongation at the anterior end into the os uteri. With the other hand elevate the handle of the elevator and depress and push forward the uterus, thus rendering the roof of the vagina tense and pushing it downward away from the rectum. Carry the scalpel into

the vagina with the right hand, and, resting it in the oval of the dilator, make an incision through the roof of the vagina, beginning at a point 8 to 10 cm. posterior to the os uteri and extending backward on the median line for a distance of 2 or 3 cm. Be careful to make the incision entirely through the mucosa, muscle, and peritoneum at the first cut, since any failure to complete it tends to cause the peritoneum to separate from the muscular coat and form a pocket between them, while the serous membrane being very elastic renders it difficult to complete the incision.

Introduce two fingers through the incision, and reaching over the side of the vagina to the right or the left, the right or left ovary respectively is recognized lying immediately against the vagina somewhat below it, just at the interior border of the pubis, in a mass consisting of the cord-like Fallopian tube and the fimbriae and its pavilion. The ovary may be distinguished as a firm oval mass 2 to 4 cm. in length and 1 to 2 cm. in its lesser diameter attached to the broad ligament. If not promptly recognized by the sense of touch, trace the vagina and uterus forwards with the fingers from the vaginal incision to the cornua and follow them as they bend forward and downward, and then backward and upward to the oviducts, until the ovary is reached where it is attached to the broad ligament, just below the fimbriated end. Grasp the ovary between the fingers and draw it through the incision into the vagina. Introduce the scissors with the other hand, and when the ovary is reached, open them barely sufficient to admit its attachments between the blades, and cut it away along with a portion of the broad ligament. Or introduce the ecraseur, and drawing the ovary through the loop of the chain, and holding it securely until the instrument is tightened, crush it off in this way. It is essential that plenty of the broad ligament and oviduct be excised with the ovary to insure the entire removal of the latter, because the accidental leaving of the smallest particle of ovarian tissue will cause a development of this into abnormally large Graafian follicles, and will tend to increase instead of decrease nymphomania. Should the animal be pregnant, the ovary on the gravid side is dragged downward and forward out of reach of the operator's fingers, and if it is desired to complete the operation it may be necessary to enlarge the vaginal wound and introduce the entire hand, when the ovary can be reached and removed. Generally, no after care is necessary.

The Dangers of Vaginal Ovariotomy.

The dangers are similar to those of the mare. The iliac arteries may be wounded in the same manner as in the mare; this is preventable by being careful to push the vaginal roof well downwards away from the rectum and sacrum. In rare instances fatal haemorrhage follows the cutting off of the ovaries with the scissors, especially in cows which are very fat and lack tone as a result of close confinement. For this reason it is apparently safer in confined cows to use the ecraseur, but even this instrument is not wholly proof against haemorrhage, and fatalities have been rarely recorded after its use, so that some veterinarians have advised ligation of the arteries

instead, but this is a complex process which requires much time for its accomplishment. A new danger appears in the presence of the rumen, the superoposterior portion of which projects into the pulvic cavity when filled with food, and if the cut is directed forwards a stab wound readily penetrates its walls with fatal results. Make the cut upwards and backwards.

Spaying by the Flank.

Instruments.—Clipping shears, convex scalpel, spaying shears, or ecraseur, heavy needle and thread.

Uses.—Same as the preceding, applicable to heifers or to cows in which the vulva is too small to admit the operator's hand or in case of diseased vagina or uterus.

The animal may be secured as in the preceding or confined in lateral recumbency with the hind legs extended backward and the anterior limbs forward. To accomplish this, locp a rope about the two fore feet, another about the two hind feet, and, drawing upon these, cast the animal and secure it in recumbency with the legs extended and body stretched by fastening the ropes to two strong posts about 8 to 10 m. apart. The operation may be performed in either flank.

Clip the hair from the upper part of the flank, disinfect an area 15 to 25 cm. square, and make an incision about 12 cm. long, beginning at a point equidistant from the anterior tuberosity of the ilium, the ends of the transverse processes of the lumbar vertebrae, and the last rib, and extend it downward perpendicularly, severing the skin and subcutaneous muscle. Divide the external oblique muscle in the direction of its fibres by means of the scalpel handle or the fingers, and repeat the process upon the internal oblique, after which puncture the peritoneum with the scalpel. Force one hand through the opening into the peritoneal cavity, and search for the ovaries at the same point and by the same method as in the preceding operation; that is, locate the uterus within the pelvic cavity, between the rectum and bladder, and trace it and then the cornu and broad ligament to the ovary. The uppermost ovary can be drawn out through the wound and cut off with the scissors or ecraseur; the lower one must be held with one hand and the instrument introduced along the arm, and when the ovary is reached, apply the scissors or ecraseur, and cut or crush it off. The beginner must always remember that the positive means for identifying the ovaries is by tracing the uterus from the vagina along its cornua to the Fallopian tube and thence to the organ in the broad ligament. Cleanse the wound and close the skin incision with continuous sutures.

Destruction of Haaspuis Bush by Locusts.

The attention of the Chief of the Sheep Division has been directed by the Sheep Inspector for the Queenstown area to the destruction of haaspuis bush (*Euryops tenuissimus*) by a certain species of locust, specimens of the locust being forwarded at the same time. The matter

was referred to the Chief of the Division of Entomology (Mr. C. P. Lounsbury), who states that the specimens are immature and he is unable to name the species. Specimens of what was probably the same species were received by Mr. Lounsbury at Capetown from Mr. F. Verran, Sterkstroom, in May, 1899, and then, as now, haaspuis bush was being destroyed. The bush in question is a pest, and, says Mr. Lounsbury, "one wishes there were more of the locusts to destroy it. A certain plant bug and a scale insect are also of economic importance, because their attack is often fatal to the plant." Adult specimens of the locust have been asked for as soon as procurable.

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

CONSTRUCTION OF COW-BYRES.

To the Editor of the *Agricultural Journal.*

Sir,—The article in March number on "The Construction of Cow-byres" is interesting; but the plans shown are too costly for the average farmer. Could you not give plans for something more suitable to the small farmer in this country, with some idea of the cost of erection? I understand that a Johannesburg vendor of milking machines and plant has designed byres suitable to our conditions of farming which can be erected at a comparatively small cost by those wishing to put up a byre for from 30 to 50 cows, with a view to installing a milking plant later when they can afford it. Perhaps you could obtain the plan and publish it.

While on the subject of buildings I think it would be helpful, especially to the new settlers on Government land, if the plans for a steading suitable for a farm of from 500 to 1500 acres were published showing plans of buildings and their position in relation to each other and to the arable lands and live stock camps so as to give the greatest scope to economy in working. I know the landscape of each farm differs; but still as the major part of the country is flat or undulating and homesteads as a rule placed under a kopje or rise for shelter it should not be difficult to devise some plan suitable for the general run of settlement farms, especially as mixed farming is the farming generally undertaken. So much depends on laying out a farm rightly at the start; not necessarily building and fencing everthing the first year, but having a plan to work up to as the means are acquired.—Yours, etc.,

Eustace S. Buttemer.

Good Hope, Swinburne,
O.F.S., 22nd March.

[The above letter was referred to the Lecturer in Engineering, Experiment Farm, Potchefstroom, who replies:—I would point out that cheaper constructions in wood and iron are mentioned in the paper in question. Even if a farmer cannot afford to complete the building internally, it would probably be to his advantage to aim at putting up a good building and to finish it internally as funds permit, e.g. a proper concrete floor may be dispensed with at first and added as soon as possible afterwards. The second point mentioned has not escaped our notice. We have in view the publication of an article on the arrangement, etc. of a steading with a view to future development. I shall endeavour to find out about plans of cheap byres suitable for the installation of milking plants.]

TANNING HIDES AND SKINS.—CHROME LEATHER.

To the Editor of the *Agricultural Journal.*

Sir,—In the March issue "Kuip" asks how to tan skins with alum and salt. I give herewith the recipe, but he will find the cost against its use with very large skins though for small ones it is splendid. "Raw Sole" also asks what chrome leather is in same issue. It is simply leather tanned with alum, and the cost is, of course, much higher than leather tanned with bark, etc.

Take a quantity of alum and place it along with a small quantity of water in an old iron pot and burn it over the fire until it gets to a dry white cake; pound this to a powder and put in a tin with perforated top. Fill another tin (perforated top) with very fine common salt. Skin the animal—anything with a hide—lay the skin out, and sprinkle the flesh side well with the alum and rub it in; then sprinkle salt over the alum sufficiently to cover it with about an equal quantity. Roll the skin up from head to tail and leave it for from three to six days according to size and thickness of skin. It should then be ready unless the skin is very large, when ten days might be needed. It only needs stretching, rubbing, and pulling about to make quite soft and pliable.—Yours, etc.

W. A. JONNES.

Brits, 18th April.

BREEDING CHEVIOT RAMS WITH AFRIKANDER EWES.

To the EDITOR of the *Agricultural Journal.*

SIR,—Could you or any of your readers inform me what results I may expect from putting colonial bred Cheviot rams among Afrikander (Cape sheep) ewes. I shall also be obliged if any of your readers would inform me who the best breeder of Cheviots would be in the Cape Province and if possible the price of a two-tooth ram.—Yours, etc.,

J. STEYN.

Red Hill, Douglas, 25th March, 1912.

[In reply to the above, the Principal Sheep and Wool Expert expresses the opinion that a Cheviot ram could not do anything else but improve Afrikander sheep. We have no information as to where such a ram could be obtained; perhaps some of our readers can assist in this direction. The cost of a two-tooth ram in England would be anything from five to fifteen guineas.—Ed. *A.J.*]

JIBBING HORSES.

To the EDITOR of the *Agricultural Journal.*

SIR,—A reader asks for a cure for jibbing horses, and as I have had some experience with such, I give this for what it is worth. I have tried almost every cure recommended and only two I have found of any real value.

There are two classes of jibbers—the excitable jibber which backs, and the stubborn jibber which will not move at all, and each requires a different treatment.

For the first, generally a keen puller when he does go, this tip answers even if not always convenient. I happened to be stuck by one one day and could not get him to do anything but back. Just then my boys brought in a pair of big oxen to fetch a weeder for work, and, being desperate, I told them to hook on in front and then started them pulling. Finding he had to go the horse tried trotting, but I kept a firm hold of him and made him walk off quietly until he steadied down and then a quick hook off and we got away nicely. A pair of mules did just as well, but a walking start was essential. Three such lessons, and for months afterwards till he died I had no further trouble.

Another pair kept me an hour stuck in a deep drift, and eventually I had to outspan to my waist in water and haul the cart out by hand. These two were stubborn and would not move any way. A friend came along and gave me the following tip. He tied both horses' tails (long tails are necessary) short to the trap behind with the reims from their headstalls so that if they pulled they have part of the strain on their tails, then we jumped aboard and he pushed the trap backwards, till the strain was on their tails and away we went. This also after a few lessons practically cured these two; after a short distance the reim works loose and is no longer necessary. There is no risk, as obviously the horse cannot kick up while the reim is secure, and when loose will not want to.

I could mention half a dozen more tips, all useless, including the outspanning and lunging the horse recommended in the March issue. One possibly certain cure is a hot potato under the tail, but an eight mile clear road, and getting your life insured first are wise precautions when this is tried.—Yours, etc.,

J. G. F.

Results of Egg-Laying Competitions.

WESTERN PROVINCE AGRICULTURAL SOCIETY.

Fourth Egg-Laying Competition.—16th May, 1911, to 15th May, 1912.

RECORD FOR MARCH, 1912, AND TOTALS TO END OF MARCH.

Pen Number.	Owner.	Breed. (Six Birds to a Pen.)	Record for Month. Eggs.	Weight. oz.	drms.	Total to Date. Eggs.	Weight. oz.	drms.	Position to Date.
1	F. W. Nicholson..	Buff Orpingtons..............	10	21	2	413	869	1	25th
2	F. T. Hobbs.....	Silver Wyandottes............	16	30	11	446	873	7	24th
3	A. Riley.........	Black Minorcas (R.C.)..........	1	2	0	314	621	9	26th
4	N. Cole.........	White Leghorns (Amer.) ...... (5 birds only; 1 died 14/2/12.)	20	41	7	594	1169	15	15th
5	S. T. Jones......	White Leghorns (Amer.)	16	38	7	556	1206	15	13th
6	H. Curtis..	White Leghorns (Amer.)	13	27	1	595	1241	3	10th
7	S. C. Skaife......	White Wyandottes............ (5 birds only; 1 died 28/2/12.)	38	69	0	566	1030	13	21st
8	A. Keppie.......	White Wyandottes............	24	42	0	521	961	12	23rd
9	S. A. West.......	White Leghorns (Amer.-Danish) (5 birds only; 1 died 5/11/11.)	15	31	11	527	1140	5	18th
10	H. H. Bright.....	Black Leghorns..............	21	42	2	711	1409	0	6th
11	B. Kauffmann ...	Brown Leghorns	36	68	6	609	1216	9	12th
12	B. Kauffmann ...	Black Leghorns	13	29	7	545	1169	5	16th
13	C. W. Pilkington.	Rhode Island Reds .... (5 birds only; 1 died 29/1/12).	54	117	2	504	1098	12	19th
14	W. P. Cowan	White Leghorns (Eng.)........	30	63	2	768	1505	13	3rd
15	A. J. Stacy......	White Leghorns (Aust.-Amer.) (Re-entered from pens Nos. 5 and 51 last competition for second year test.)	9	19	2	751	1589	11	1st
16	B. Kauffmann ...	White Leghorns (Eng.-Amer.).. (5 birds only; 1 died 18/11/11.)	39	80	9	711	1491	11	5th
17	S. Smith........	Brown Leghorns	33	66	1	526	1079	13	20th
18	Mrs. H. H. Bright	White Leghorns (Aust.)....... (4 birds only; 2 died 2/11/11.)	42	83	7	671	1283	4	9th
19	N. Cole.........	Brown Leghorns..............	8	16	8	615	1291	5	8th
20	F. Molteno	White Leghorns (Amer.)	19	36	12	632	1174	14	14th
21	C. H. van Breda..	White Leghorns (Aust.)	36	70	0	805	1563	8	2nd
22	Mrs. C. H. van Breda	White Leghorns (Amer.).......	27	52	1	625	1221	8	11th
23	S. A. West.......	Brown Leghorns	24	46	3	606	1148	14	17th
24	Graham, Hope & Co.	White Wyandottes	36	71	13	681	1358	9	7th
25	R. V. R. Jones...	White Leghorns (Amer.-Aust.).	15	33	4	497	981	1	22nd
26	S. Smith........	White Leghorns (Dan. & Amer.)	43	84	4	777	1493	10	4th

Importation of Live Stock.

RETURN showing particulars of certain Pure-Bred Live Stock imported into the Union of South Africa.

Stud-Book No. or Name.	Breed and Stud-Book in which Registered.	Sex.	Country of Origin.	Importer's Name and Address.
No particulars...	98 Merino sheep........	Rams	Australia..	W. B. Mein, East London (25/3/12).
2912, 2937, 2966, 2953, 2955, 2920, not numbered, 2965, 2877, 2929, 2829, 2887, 2835, 2951, 2970, 2747, 2847, 2941, 2972, 2736, 2723, 2863, 2746, 2782, 2753	Tasmanian............	Rams	Tasmania..	C. A. Pope, Molteno, Cape Province (23/3/12).

Notes on the Weather.

NATAL.—MARCH.

LIGHT rains fell everywhere during the month and the rainfall seems to have been fairly well distributed all over the Province. The northern districts experienced two fairly wet days, the 1st and 2nd, the rainfall ranging from 1 inch at Nongoma to 4·7 inches at Mtunzini. In the Midlands and north-western districts the wettest days were the 9th and 10th, at Newcastle 2·4 inches being registered on the 9th and at Greytown 4·25 inches between the 9th and 10th. The South Coast had a fair share of rain during the month without any particularly wet day.

The 8th and 9th were the hottest days of the month throughout the Province, and were at the majority of stations followed by the wettest days. At Harding, Mid-Illovo, Bulwer, Richmond, Howick, Cedara Vlei, Albert Falls the 8th appears to have been very hot and was followed by a fairly wet day on the 9th. The absolute maximum temperatures ranged from 80° at Bulwer, 5100 feet above sea-level, to 102° at Weenen on the 9th, temperatures being higher in the Midlands and south than on the North Coast, the mean daily range being also higher in the Midlands than on the coast.

With the exception of Paulpietersburg, where thunder was reported on eight days during the month, very few thunderstorms are reported from other stations. On the 26th a severe storm passed over Mid-Illovo accompanied with hail but little harm was done.

The weather for March has been showery and cloudy without any remarkably wet day, except on the 2nd when 4·7 inches fell at Mtunzini.—J. C. MELDRUM, Assistant, for Government Astronomer.

OBSERVERS' NOTES.

Imbizana.—A very short rainfall for the month—about half the average—following a season of shortage makes a theatening outlook for the winter. Among European farmers the mealie crop will average not much below the usual, but there will be great shortage among the natives. Citrus fruits promise to be a moderate crop both in quantity and size of fruit. Stock are doing very well and so far this district has been one of the most fortunate in escaping the ravages of horse-sickness. (C. H. Mitchell.)

Mid-Illovo.—During March we have had warnings that winter is close at hand, the air at night frequently being crisp and keen. The maximum for the month was 92° on the 8th, followed by a hot wind that night; the minimum being 53° on the 11th. Rain totalling 3·61 inches fell on 12 days, the heaviest rainfall being 1·15 on the night of the 9th. On the evening of the 26th a severe thunderstorm passed over the district accompanied with hail, which fortunately did not do much harm. The mealie crop with the exception of late plants is filling out well. Winter crops of potatoes are now planted, and forage is looking well. Horse-sickness is still prevalent in the Richmond district, otherwise stock are in good condition and doing well. (J. W. V. Montgomery.)

Nottingham Road.—Very unusual cold south-westerly winds from the 10th to the 15th with slight frost at Mooi River. This cold snap has checked horse-sickness a little. Weather is very favourable for fodder and hay-making. Owing to drought in January the turnip crop is not as good as usual.

Ladysmith.—The total rainfall for the month was 2·25 inches as against 4·19 inches for the month of March, 1911. The mean maximum temperature was 86 compared with 83 for March, 1911, and the mean minimum 57 being the same as that for the same month of 1911. Apart from the low rainfall, conditions during the month have been normal. The mealie crop will probably be poor. (J. C. Haycroft.)

Ngomi Forest.—During March rain was recorded on twenty-two days with a total rainfall of 7·96 inches. The heaviest rainfall was on the 3rd when 2·20 inches were recorded. The rainfall for this month has been far heavier than March, 1910, and March, 1911. In March, 1910, 4·94 inches were recorded and in March, 1911, 5·05 inches. During the month we have had three thunderstorms, on the 1st, 3rd, and 17th. The storm on the 3rd was the heaviest. The temperature for the month has been fairly good. On the 10th the thermometer did not go above 51°; a heavy mist and light rain continued all day. Temperature for the month, maximum 84°, minimum 46°. Means for the month, maximum 72·7°, minimum 54·4°. Crops are looking well. Several of the natives should reap fairly good crops, others will reap a very poor harvest. Cattle, etc., are looking well. (W. H. Foster.)

Empangeni.—The weather during March has been very fair with the exception of the 11th and 12th which were very bad; strong south wind blowing with rain. The highest temperature for the month was 93° in the shade. Mealies are becoming ripe and cane crops looking very well indeed, and also all stock in the district. Rain is needed as the land is very dry indeed. (Forester Tarboton.)

TEMPERATURE (NATAL), MARCH.

Station.	Mean Maximum.	Mean Minimum.	Monthly Mean.	Abs. Maximum.	Abs. Minimum.	Mean Daily Range.
	°	°	°	°	°	°
Observatory, Durban	80·3	65·6	73·0	86	58	14·7
Stanger	84·2	64·2	74·2	95	56	20·0
Verulam	84·9	63·3	74·1	96	57	21·6
Hillary	78·5	64·4	71·5	87	57	14·1
Umbogintwini	83·8	63·9	73·9	92	56	19·9
Winkle Spruit	80·1	63·1	71·6	86	56	17·0
Umzinto	87·9	69·8	78·9	92	65	18·1
Port Shepstone	80·7	64·6	72·7	90	54	16·1
Imbizana	80·8	63·7	72·3	92	53	17·1
Harding	83·9	53·0	68·5	98	46	30·9
Mid-Illovo	74·1	58·4	66·3	92	48	15·7
Bulwer	68·2	52·2	60·2	80	42	16·0
Himeville	75·9	49·5	62·7	87	39	26·4
Richmond	77·6	56·5	67·1	93	47	10·5
Pietermaritzburg	81·0	57·5	69·3	97	49	23·5
Howick	79·5	54·8	67·2	94	46	24·7
Cedara Vlei	75·6	52·6	64·1	90	42	23·0
Albert Falls	85·0	58·5	71·8	99	51	26·5
New Hanover	83·9	57·5	70·7	97	45	26·4
Greytown	79·5	54·2	66·9	98	41	25·3
Krantzkop	87·3	57·8	72·6	92	50	29·5
Lidgetton	80·3	43·0	61·7	94	32	37·3
Nottingham Road	76·5	47·3	61·9	88	38	29·2
Estcourt	95·5	56·5	76·0	100	45	39·0
Weenen	90·1	57·9	74·0	102	51	32·2
Mpofana	80·9	53·4	67·2	94	48	27·5
Ladysmith	85·8	57·3	71·6	98	45	28·5
Dundee	79·6	57·4	68·5	92	48	22·2
Newcastle	84·9	50·9	67·9	98	40	34·0
Utrecht	—	—	—	—	—	—
Vryheid	78·8	53·6	66·2	90	46	25·2
Paulpietersburg	—	—	—	—	—	—
Ngomi Forest	72·7	54·4	63·6	84	46	18·3
Hlabisa	76·3	59·8	68·1	83	54	16·5
Mahlabatini	79·9	51·7	65·8	86	48	28·2
Melmoth	78·1	59·0	68·6	91	52	19·1
Empangeni	82·7	62·4	72·6	93	56	20·3
Mtunzini	84·1	54·5	69·3	90	50	29·6
Amatikulu	85·5	63·5	74·5	94	58	22·0
Ingwavuma	78·8	60·1	69·5	93	50	18·7
Ubombo	76·2	64·5	70·4	86	57	11·7
Nongoma	79·2	57·3	68·3	88	46	21·9
MEANS	81·0	57·7	69·3	—	—	23·1
EXTREMES	—	—	—	102	32	—

TRANSVAAL PROVINCE.—MARCH.

SUMMARY.—The rainfall for the month approximated the average, although the distribution was somewhat irregular. The greatest shortage occurred in the north of the Province and the greatest excess in the District of Carolina. The season's rainfall (nine months) still shows a deficit in all but the south-western and extreme south-eastern districts. The shortage remains very considerable in many parts; at Potgietersrust and Leydsdorp it is still about 10 inches, and at Pietersburg and Barberton about 9 inches.

OBSERVERS' WEATHER REPORTS.

BETHAL DISTRICT—

Leeuwkuilen.—The distribution of rain for March has been quite good and better than for the previous two months. Heavy mists and dews have been frequent. On the 10th and 11th the temperature as registered by the grass minimum thermometer went down to 36° and 34·5°, the nights being very cold. The rains from the 26th to the end of the month were most welcome, many farmers in the vicinity having had to stop ploughing owing to the dry nature of the soil. Heavy storms were experienced during this month by my neighbours to the south; in some instances they were unable to ride off oats from the lands, which were too wet and soft. (W. J. Wayland.)

LYDENBURG DISTRICT—

Belfast.—Welcome showers fell during this month; the heaviest fall was on the 31st when 1·42 inches were recorded. The weather got cold towards the close of the month. (G. J. Imrie.)

Graskop.—A very severe thunderstorm was experienced on the night of the 9th; over 5 inches of rain fell within twenty-four hours which did a lot of damage in this district. Most of the rain that fell during the month came in heavy thundershowers, and did more harm than good. (G. Irvine.)

Lydenburg.—Good rains fell during this month, but rather too late to do any good. (Sergeant H. G. Caldwell, Transvaal Police.)

MIDDELBURG DISTRICT—

Middelburg.—The rainfall over the town has been half an inch less than the average for the month, and has fallen in small amounts and at weekly intervals. No hailstorms have been experienced, but some severe storms have been reported from surrounding parts. At Pan 1 inch of rain and hail fell in a short time; considerable damage was done to crops, which were washed out of the ground. The month has been fine and temperate on the whole, the mean temperature falling but 1 degree below that of the previous month. (Dr. H. A. Spencer.)

PIET RETIEF DISTRICT—

Cascades.—The weather generally was very changeable during this month; on the afternoon of the 6th a heavy hailstorm passed over this part of the district, doing considerable damage, even killing goats in some parts. Slight frosts on the 11th and 14th, which were the result of cold winds from the south for four days; a good deal of heavy thunder and lightning was experienced. (F. Bresler.)

POTCHEFSTROOM DISTRICT—

Haaskraal.—The first half of the month was very dry. On the nights of the 10th, 11th, and 12th the temperature fell to 32°; the weather then became warm again, the 28th being a very hot day. (G. G. Moody.)

STANDERTON DISTRICT—

Weltevreden.—The weather during March has been very threatening, but only a few local showers have fallen. On one or two occasions severe thunderstorms were experienced. Two hailstorms passed not far from this station but did very little damage. About the middle of the month the weather became very cold, but up to the present there has been no frost. (D. Lane.)

WAKKERSTROOM DISTRICT—

Wakkerstroom.—The rain has been above the average this month. A cold snap was experienced for about five nights during the middle of the month. (W. Pritchard.)

WATERBERG DISTRICT—

Potgietersrust.—This has been the calmest March for two years, the wind the greater part of the day during the last week coming from the south. The total rainfall for March is the heaviest recorded for any month during the season, viz., 2·97 inches. (J. Nicholson.)

ZOUTPANSBERG DISTRICT—

Clear Waters, Haenertsburg.—Rain has threatened during the month, but the clouds did not break. Nights cold, every indication of early frosts; if frost comes mealie crops will be ruined owing to late sowing. (A. K. Eastwood.)

Kalkfontein No. 129.—The rainfall this season has so far fallen in purely local showers, parts near by receiving a good deal more than has fallen at this station. Crops are a total failure in the vicinity. The mornings and evenings are getting chilly. There will be no winter grazing for stock here. (C. Newham.)

Louis Trichardt.—A month of unusually bright fine days. Temperatures ruled high, the mean maximum being several degrees above the average for March, though several wide extremes were experienced. There is a noticeable improvement in the veld, due to the late rains which fell in February. (Sergeant J. C. N. Clark, Transvaal Police.)

Mara.—This has been the driest season experienced for over twenty years; all crops are dead and water-runs dried up in this neighbourhood. (M. Heuschel.)

Pietersburg.—Towards the close of the month the mornings were generally misty. Drought still continues, a feature being showers that last from a few seconds to a couple of minutes. Since first week in October 7½ inches of rain have fallen. The only heavy rainfall since the first week in October was experienced on the 16th, when 0·55 inches was registered. (C. C. Hicks.)

TEMPERATURE.

Place.	Observer.	For the Month. Mean Max.	Mean Min.	Mean.	Average Mean during past nine years.	Difference from average mean.
		°	°	°	°	°
Barberton.........	H. G. Williams......	79·9	61·1	70·5	70·6	— 0·1
Bloemhof.........	C. C. Campbell......	82·8	56·0	69·4	69·3	+ 0·1
Johannesburg—						
Joubert Park....	Geo. Weeks.........	74·9	53·1	64·0	63·5	+ 0·5
Observatory.....	Staff...............	73·0	53·8	63·4	62·5	+ 0·9
Komatipoort......	H. J. Evans........	88·4	65·0	76·7	76·1	+ 0·6
Pietersburg.......	W. Frankleyne......	82·5	56·8	69·6	67·3	+ 2·3
Pretoria, Arcadia..	J. Lyall Soutter......	82·2	54·5	68·4	67·9	+ 0·5
Volksrust.........	Station Master, S.A.R.	76·5	50·3	63·4	61·2	+ 2.2
Zeerust...........	H. Dietrich, J.P......	83·1	57·8	70·4	69·3	+ 1·1

Day temperatures have varied in different parts of the Province from 4° above to slightly below the mean; the average day temperature has been 2° above normal. Night temperatures have been practically normal over the whole Province. A hot spell was experienced about the 9th of the month.

Rainfall Returns.

NATAL—MARCH.

	Inches.		Inches.
Durban (Observatory)	3·73	Nottingham Road	3·40
Stanger ...	3·84	Estcourt	3·35
Verulam	4·01	Weenen ...	3·14
Hillary ...	3·39	Mpofana	2·68
Umbogintwini ...	4·65	Ladysmith	2·25
Winkle Spruit ...	2·79	Dundee ...	2·77
Umzinto	2·51	Newcastle	4·56
Port Shepstone	2·80	Utrecht ...	7·02
Imbizana	2·38	Vryheid ...	3·26
Harding	3·11	Ngomi Forest ...	7·96
Mid-Illovo	3·61	Ingwavuma	3·72
Bulwer ...	5·74	Ubombo	2·02
Himeville	5·27	Nongoma	3·90
Richmond	3·31	Hlabisa ...	5·82
Pietermaritzburg	1·58	Mahlabatini	3·22
Howick ...	2·52	Melmoth	3·52
Cedara (Vlei) ...	3·15	Empangeni	5·39
Albert Falls	1·86	Mtunzini	9·23
New Hanover ...	2·29	Amatikulu	3·56
Greytown	5·52	Durban (Point)	5·43
Krantzkop	2·79	Pietermaritzburg (Burger Street)	1·99
Ladgetton	4·63	Bushman's Nek	1·56

TRANSVAAL—MARCH.

	Inches.		Inches.
Barberton	2·61	Potchefstroom ...	2·83
Komatipoort	4·53	Klerksdorp	1·69
Bethal ...	4·38	Pretoria (Arcadia)	2·69
Bloemhof	1·47	Modderfontein ...	4·53
Christiana	0·83	Rustenburg	3·57
Carolina	5·15	Standerton	3·71
Ermelo ...	2·86	Mbabane	5·60
De Hoop	3·13	Wakkerstroom ...	4·83
Heidelberg	2·13	Potgietersrust ...	3·26
Vereeniging	3·55	Krugersdorp	3·78
Lichtenburg	4·57	Joubert Park (Witwatersrand)	2·19
Pilgrims Rest ...	5·36	Observatory	2·58
Belfast ...	5·75	Pietersburg	1·29
Zeerust ...	1·38	Louis Trichardt	1·72
Middelburg	2·94	Leydsdorp	2·80
Piet Retief	4·81		

Outbreaks of Animal Diseases.

THE following outbreaks of scheduled infectious and contagious animal diseases have occurred in the areas specified during the month ended 30th April, 1912.

C. E. GRAY,
Principal Veterinary Surgeon (Union).

CAPE PROVINCE PROPER.

(EXCLUDING TRANSKEIAN TERRITORIES.)

Anthrax.

District.	Area.	Number of Deaths.	Number of In-contacts.
Albany	Bezuidenhoutsfontein	1	Unknown
"	Grahamstown	1	Nil
"	Grahamstown Commonage ...	1	Unknown
Alexandria	Farm "The Post"	1	80
"	Sandflats...	1	Unknown
"	Schietrug	15	Unknown
Komgha	Farm No. 247	1	16
"	Farm No. 208	1	Unknown
"	Farm No. 13, xiii/35, Kei Kop...	1	29
Kuruman	Fernleigh	1	69
Uitenhage	Mooimansheuvel Aloes	1	Unknown
Vryburg	Distin	1	10
"	Woodrust	24	60
"	Gamabot	1	40

East Coast Fever.

District.	Area.	Number of Animals Sick.	Number of Animals Died or Destroyed.	Number of Animals In-contact.
East London	Kumkani, Lots 14, 15, and 15a, Ward 7	1	Unknown	Unknown

Epizootic Lymphangitis.

District.	Area.	Number of Animals affected.	Number of Deaths.	Number of In-contact Animals.
Humansdorp ...	Patentie West	1	Nil	Nil
" ...	Stilgenoog	Nil	1	Nil

Scabies (Equine).

District.	Area.	Number of Animals Affected.	Number of In-contact Animals.
Albany	Grahamstown Commonage ...	2	Nil
Alexandria	Dekselsfontein	1 destroyed	2
Humansdorp	Erf No. 2, Block B	2	Nil
"	Weston	1	..
" . ..	Humansdorp	1	..
" . ..	Kleinfontein	1	..
Stockenstrom . ..	Bergvliet, Seymour	4	..

Glanders.

District.	Area.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of In-contact Animals Tested.
Albany	Grahamstown... ...	1	Nil	Unknown
"	"	1	"	"
Alexandria	Dekselsfontein ..	1	..	"
Wodehouse	Dordrecht	3	1	15

Swine Fever.

District.	Area.	Number Sick.	Number Died or Destroyed.	Number of In-contacts.
Paarl	Paardeberg	10	2	200

Tuberculosis.

District.	Area.	Number of Animals Tested.	Number of Reactions to Test and Destroyed.	Number of Doubtful Reactions to be Retested.
Cape	Various	131	Nil	1
Malmesbury	" ...	45	"	Nil
Paarl	"	38	2	2
Stellenbosch	"	38	2	1

R. W. DIXON,
Senior Veterinary Officer (Cape).

TRANSKEI TERRITORY.

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Flagstaff	Mpovane's Location	2	173
"	Vutela's Location	1	200
"	Matiwa's Location	—	
"	Seketwayo's Location	—	-
Ngqeleni	Lindinpiwa's Location... ...	---	-
"	Msolo's Location		-
"	Fulela's Location	--	
"	Gqina's Location	--	—
Mqanduli	Commonage		
Engcobobo	Gova's Location...	2	2000
"	Mgqanyana's Location... ...	12	1500
"	Tafa's Location	—	—
"	Zekelo's Location	—	
Idutywa	Western portion of Commonage	1	154
"	Mzawali's Location	24	520
"	Dinizulu's Location ...	1	192
"	Mdlunga's Location		--
"	Zenzeli's Location		—
Umtata	Mpondombini's Location ...	3	580
"	Gxwali's Location ...	4	-
"	Hampsonshope	—	
"	Zwartfontein		-
"	Nooitgedacht		
Lusikisiki	Maheneza's Location	64	218
"	Macupa's Location	16	55
Mount Currie	Podvenia...		-
"	Modderfontein		--
Kokstad	Commonage	—	
Butterworth	Fennell's Farm, Ntlambi ...	—	-
Willowvale	Wapi's Location	-	---
"	Mbangi's Location	--	—
Umzimkulu	Oliphantshoek	—	-
"	Uitkomst...	1	175
Mount Frere	Mohe's Location	1	45
"	Ngogwana's Location	--	—
Tsolo	Mdetshwa's Location	—	—
"	Lochenberg's Location... ...	--	—
"	Bulembu Farm	1	41
Mount Ayliff	Mlshalushana's Location ...	—	—
"	Ndzengiseni's Location... ...	---	—
"	Dutyin's Location	-	—

Anthrax.

Butterworth	Silinga's Location	—	---
"	Veldman's Location	—	—
"	Nguzu's Location	—	—
Umtata	Roani's Location	—	
"	Jobolondwana's Location ...	--	-
"	Maxongo's Location	—	---
"	Mkangeli's Location		—
Kentani	Somana's Location		
"	Mngango's Location	-	
Idutywa	Bangiso's Location	-	—

Lungsickness

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Nqamkwe	Nyidlana's Location	—	
"	Nyila's Location		—
Engcobo	Ntaka's Location	—	—
"	Blyth	—	—
"	Ben's Location		—
Tsolo	Nqamba Forest Reserve ...	—	—

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of Contacts Tested.
Idutywa	Mpalse	2	1	
Port St. Johns	Tombo	2		—

NATAL.

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Alexandria Division ...	Ellesmere	—	—
" " ...	Ellesmere D		—
" " ...	The Medal	—	—
" " ...	Crilly	—	—
Alfred Division	Glenknoll		—
" "	Beaconsfield		
" "	St. Helena		—
Dundee Division	Mount Johanna	—	—
Estcourt Division	Labuschagne's Kraal		—
" "	Enon		
Ixopo Division	Westell Grange		
" "	Valhalla		
Ladysmith Division ...	Sub. A of Onbekend		
" " ...	Braemar		—
" " ...	Brak Spruit		—
Lower Umzimkulu Division	Lot No. 16, Umtamvuna ...	—	—
" " "	Esher		—
" " "	The Marble Quarries	—	—
" " "	Lot No. 14	—	—
" " "	Lot No. 17		—
Newcastle Division ...	Killkeel		—
" " ...	Spitzkop No. 5	7	—
" " ...	Ismere (Ingogo)...	—	123
" " ...	Camelot		—
" " ...	Dunfermline	—	
Ngotshe Division	Bredina	—	—
Polela Division	Kavelar		—
Utrecht Division	—	—	—
Weenen Division	Bushman's River Poort ...	2	19

Mange in Equines.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Mtunzini, Zululand ...	St. Andrews	- -	—
Reserve No. 21, Amatikulu, Zululand	-	-	1

Epizootic Lymphangitis.

New Germany, Umlazi Division	—	1	...
Port Shepstone	-	1	—
Stanger	-	1	3

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of In-contacts Tested.
Dundee Division ...	Hatting Spruit Colliery	2	1	32
" " ...	Hatting Spruit Station	---	2	25

Trypanozoonosis. Nagana

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Zululand	Ubombo	1	-
"	Somkele	1	-

W. M. POWER,
Senior Veterinary Officer (Natal).

TRANSVAAL.

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Pretoria	Zuurfontein	1	
Potchefstroom	Ventersdorp	1	

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Piet Retief	Tafelberg No. 123	1	23

Lungsickness.

Krugersdorp...	Doornbosch No. 94	1	—
Heidelberg	Hartzenbergfontein No. 132 ...	1	--

Tuberculosis.

District.	Name of Farm	Number of Animals Tested	Number of Reactions to Test and Destroyed.	Number of Doubtful Reactions.
Standerton	Niekerk's Vlei ...	1	1	—
Pretoria	Pretoria United Butchery	(Animal discovered at slaughter-poles).		

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed	Reacted to Test and Destroyed.	Number of In-contacts Tested.
Middelburg	Gloria No. 335 ...	—	3	6
Witwatersrand ...	39 Main Street, Johannesburg	1	—	—
Middelburg	Roodepoort	1	2	8

ORANGE FREE STATE.

Mange in Equines.

District.	Name of Farm.	Number of Animals Affected.	Number of In-contacts.
Winburg	Ferreirasrust	1	1

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of In-contacts Tested.
Bloemfontein	51 West Burgher Street	—	1	—

Agricultural Show Dates, 1912.

NATAL PROVINCE.

Newcastle.—Thursday and Friday, 6th and 7th June.
Vryheid.—Tuesday, 11th June.
Dundee.—Thursday and Friday, 13th and 14th June.
Klip River (Ladysmith).—Tuesday and Wednesday, 18th and 19th June.
Weenen (Estcourt).—Thursday and Friday, 20th and 21st June.
Umvoti (Greytown).—Thursday and Friday, 20th and 21st June.
Lion's River.—Tuesday, 25th June.
Maritzburg.—Thursday, Friday, and Saturday, 27th, 28th, and 29th June.
Durban.—Wednesday, Thursday, and Friday, 3rd, 4th, and 5th July.
Lower Umzimkulu (Port Shepstone).—Tuesday, 9th July.
Stanger.—Wednesday, 10th July.
Camperdown.—Thursday, 25th July.
New Hanover.—Wednesday, 24th July.
Richmond.—Unfixed.
Ixopo.—Thursday, 20th June.
Noodsberg Road.—Unfixed.

TRANSVAAL PROVINCE.

Wolmaransstad—Wednesday, 15th May.

NOTE.—The Lydenburg Society has decided not to hold a Show this year.

Farm Employment.

Young man seeks employment on farm, with a view to learning farming. Speaks English and Dutch.—V. HAUTEKIET, Nieuport, Bains, Belgium. [2]

Young man seeks employment on farm in order to learn farming.—ELLESMERE ELLIS, P.O. Box 1025, Johannesburg. [4]

South African Produce Markets.

CAPETOWN.

The Produce Department of the firm of R. Müller, Capetown, reports under date of the 27th April, 1912, as follows:—

Ostrich Feathers.—A satisfactory turnover has taken place in Capetown, both in the public market and also out of hand. Prices all round have been in sellers' favour. The demand for all classes of good feathers is very good indeed. However, also, the inferior goods realize comparatively good prices, as will be seen from the following quotations:—

	£	s.	d.		£	s.	d.
Primes	18	10	0	to	29	0	0
First	12	10	0	„	17	10	0
Second whites	8	0	0	„	10	10	0
Third whites	3	10	0	„	7	10	0
Inferior and stalky whites	1	5	0	„	3	0	0
Byocks and fancy	2	0	0	„	9	0	0
Superior feminas	10	0	0	„	15	0	0
First feminas	7	10	0	„	9	10	0
Second feminas	4	0	0	„	6	0	0
Third feminas	1	5	0	„	3	15	0
Greys	1	10	0	„	7	0	0
White boos	0	15	0	„	2	10	0
Light boos	0	12	6	„	1	15	0
Dark boos	0	3	0	„	0	15	0
Inferior boos and tipless	0	1	0	„	0	12	6

	£	s.	d.		£	s.	d.
Long blacks	2	10	0	to	6	10	0
Medium blacks	2	0	0	„	3	10	0
Short blacks	0	6	0	„	1	5	0
Long floss black	1	7	6	„	2	10	0
Medium floss black	0	12	6	„	1	5	0
Short floss black	0	7	6	„	0	10	0
Long drabs	2	0	0	„	3	10	0
Medium drabs	0	10	0	„	1	5	0
Short drabs	0	3	0	„	0	7	6
Long floss drabs	1	7	6	„	2	0	0
Medium floss drabs	0	12	6	„	0	17	6
Short floss drabs	0	5	0	„	0	8	0
Inferior long blacks and drabs	0	12	6	„	1	15	0
Common blacks and drabs	0	1	0	„	0	5	0
Spadonas	0	10	0	„	3	0	0

Wool.—All light condition grades, as well as snow whites, keep very steady in price. Heavy wools, however, have receded 5 per cent. It is in the interest of woolsheep farmers to free their clips as much as this can be done of all and any unnecessary weight occasioned by sand and similar substances. The following are to-day's Capetown prices:—

	d.		d.
Roggeveld and Long Karoo	6	to	7½
Calvinia, short	5	„	5½
Calvinia, long	5¾	„	6½
Short burry wools, light	4¾	„	5½
Short burry wools, heavy	4	to	4¾
C. and C., grease, good quality	4¾	„	5½
C. and C., medium	3½	„	4½
C. and C., inferior	1	„	3

Skins.—Light goats have receded ½d. per lb. Otherwise prices have proved quite steady. Demand in the Capetown market leaves nothing to be desired. Competition is sound. Unlimited quantities are being taken up readily. Once more I wish to impress upon farmers that they give strictest orders to prevent bad cuts. Further, they should see that the skins are properly salted at the right time and thereafter dried in the shade.

Goatskins, light	13d. per lb.
Goatskins, heavy	10½d. per lb.
Angoras	7d. per lb.
Angoras, bastard	10d. per lb.
Longwools, Caledon	5½d. per lb.
Longwools, grasveld	5½d. per lb.
Longwools, Karoo	5d. per lb.
Shortwools	3½d. per lb.
Pelts and damaged	3d. per lb.
Bastards	4½d. per lb.
Capes, large	3s. each.
Capes, medium	2s. 3d. each.
Cape, cut	1s. 3d. each.
Small and damaged	7d. each.

PORT ELIZABETH.

Messrs. John Daverin & Co. write, under date 27th April:—

Ostrich Feathers.—There was a full three-and-a-half days' sale held this week, when the usual average assortment was offered.

On Monday competition was very active and extreme prices were paid. On Tuesday and Wednesday the tone was not so strong, but on the whole prices showed little change.

On Thursday, however, the market ruled weaker, and this we think was chiefly owing to the very large quantity put through, and from all we can learn we do not think there is likely to be much change now for some little time.

There has been very little business done out of hand.

The total quantity sold on the public market this week amounted to £35,519. 17s. 5d., and weighed 12,383 lb. 6½ oz., which constitutes a record for one week's transactions.

We quote the following as current prices of—

	£	s.	d.		£	s.	d.
Primes:							
Extra super	22	10	0	to	30	0	0
Good	14	0	0	„	20	0	0
Whites:							
Good to super	10	0	0	„	13	0	0
Good average	8	0	0	„	9	0	0
Average	7	0	0	„	8	0	0
Common and narrow	2	15	0	„	5	0	0
Good broken	7	0	0	„	9	10	0
Thirds	1	10	0	„	3	10	0
Fancies:							
Good	6	15	0	„	8	5	0
Ordinary	5	0	0	„	6	10	0
Feminas:							
Super	10	10	0	„	16	0	0
Good average	6	15	0	„	9	0	0
Average	4	15	0	„	5	15	0
Common and narrow	1	5	0	„	3	5	0
Good broken	4	15	0	„	8	0	0
Thirds	1	0	0	„	2	5	0
Greys:							
Good	5	10	0	„	8	0	0
Ordinary	2	15	0	„	4	10	0
Tails:							
Male, good, big, bold	2	0	0	„	3	5	0
Male, good average	1	5	0	„	2	0	0
Short and narrow	0	10	0	„	0	17	6
Female, light, good big, bold	1	10	0	„	2	5	0
Female, light, good average	0	15	0	„	1	0	0
Female, light, short and narrow	0	3	6	„	0	10	0

	£	s.	d.		£	s.	d.
Tails (contd.):							
Female, dark, good, big, bold	0	15	0	to	1	2	6
Female, dark, good average	0	5	0	„	0	15	0
Female, dark, short and narrow	0	0	6	„	0	2	6
Blacks:							
Long (special)	5	15	0	„	8	10	0
Long, good	3	7	6	„	4	5	0
Long, fair	2	10	0	„	3	5	0
Long, drabby	1	10	0	„	3	0	0
Medium	1	10	0	„	3	5	0
Short	0	5	0	„	1	2	6
Wiry	0	0	6	„	0	2	0
Floss, long	0	15	0	„	1	12	6
Floss, short	0	6	6	„	0	12	6
Drabs:							
Long, special	3	0	0	„	4	5	0
Long, good	1	10	0	„	2	10	0
Long, fair	1	0	0	„	1	7	6
Medium	0	12	6	„	1	7	6
Short	0	2	6	„	0	6	0
Wiry	0	0	3	„	0	1	0
Floss, long	0	15	0	„	1	12	6
Floss, short	0	6	6	„	0	10	0
Spadonas:							
Light (special)	4	0	0	„	5	0	0
Light, fair to good	1	10	0	„	3	0	0
Light, narrow	0	12	6	„	1	0	0
Dark	1	0	0	„	2	10	0
Chicks	0	0	6	„	0	2	6

The following may be quoted as the approximate current values of unsorted parcels per line:—

	Whites.							*Feminas.*						
	£	s.	d.		£	s.	d.	£	s.	d.		£	s.	d.
Superior pluckings	8	10	0	to	10	0	0	7	0	0	to	8	10	0
Good average lots	7	5	0	„	8	0	0	5	10	0	„	6	10	0
Poor average lots	4	15	0	„	5	15	0	3	5	0	„	4	5	0
Common lots, stalky, narrow, and discoloured	3	10	0	„	4	10	0	1	15	0	„	3	0	0

	Tails.					*Blacks.*					*Drabs.*					*Spadonas.*				
	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s.	d.
Good	12	6	to	22	6	25	0	to	65	0	15	0	to	25	0	30	0	to	40	0
Average	8	0	„	12	6	14	0	„	17	6	7	6	„	12	6	20	0	„	30	0
Poor	3	6	„	5	0	10	0	„	12	6	4	0	„	7	6	5	0	„	15	0

It will be understood that for special lots these quotations may be exceeded.

Wool.—There is a steady demand for all light well conditioned clips, but wasty and faulty lots are very difficult to move, except at low prices. In fact, short faulty wools are ¼d. to ½d. lower than they were two weeks ago.

At the Catalogue Sale on Wednesday 3400 bales were offered, of which 956 bales were sold.

All light conditioned wools brought full prices, but short wasty wools were entirely neglected, and in many instances no bids were made, and in other cases anything from 4d. to 4½d. was offered.

On the Public Market on Thursday a large quantity was offered, chiefly made up of the usual oddments and C. & C. Grease wools, especially of the short faulty type were quite neglected, and a large proportion was withdrawn at very low bids. C. & C. showed little change.

We quote the following as current prices of:—

	d.		d.
Snow-white extra superior	18½	to	19½
„ superior	17	„	18
„ good to superior	16	„	16½
„ inferior faulty	13	„	15
Grease, super long, well-conditioned, grassveld grown (special clips)	9	„	10
Grease, super long, grassveld grown	7½	„	8½
Grease, super long, Karoo grown (special clips)	7½	„	8
Grease, super long, Karoo grown	6¾	„	7½
Grease, super long, mixed veld	6¼	„	7¼
Grease, light, faultless, medium, grassveld grown	6	„	6½
Grease, light, faultless, medium, Karoo grown	6	„	6½
Grease, light, faultless, short, Karoo grown	5	„	5¾
Light Karoo lambs	6	to	6½
Crossbred grease	5	„	5½
Crossbred scoured	12½	„	14
Grease, coarse and coloured	3½	„	4½
Scoured, coarse and coloured	3	„	8
Basuto grease, short	5½		
O.F.S. grassveld grease, long and well-conditioned (special clips)	6¾	„	7
O F.S. grassveld grease, long and well-conditioned	6	„	6½
O.F.S. grassveld medium grown, light, with little fault	5½	„	6¼
O.F.S. grassveld short, faulty, and wasty	4	„	5
O.F.S. Karoo grown, long and well-conditioned	6	„	6¼
O.F.S. medium grown, light, with little fault	5	„	5½
O.F.S. short, faulty, and wasty	4	„	4½

Mohair.—This market still continues very quiet, and only a very moderate business has been done during the week in the open market. At present the prospects by no means look cheerful, and we would recommend caution.

On the public market on Tuesday a large quantity was offered, chiefly made up of mixed Free State parcels, prices showing very little change.

We quote the following as *nominal* values of:—

	d.		d.
Super summer kids	special		
Ordinary kids and stained	12	„	14
Superior firsts, special clips	10	„	10½
Ordinary firsts	9¼	„	9½
Short firsts and stained	8½	„	9
Superfine long blue O F.S. hair	10	„	11
Mixed O F.S. mohair (average)	9	„	9½
Mixed O.F.S. mohair, very mixed	7½	to	8½
Seconds and grey	7	„	8
Thirds	5	„	6
Winter kids, special clips	12½	„	13
Winter kids, good ordinary	11	„	12
Winter mohair	7½	„	8
Mixed mohair	7½	„	9½

Skins.—We sold this week:—

Sheepskins, 4½d. per lb., damaged, 3½d. per lb.; pelts, 2½d. per lb.; damaged, 1½d. per lb. Hair: Capes, 2s. 2d.; sundried, 1s. 2d. each; cut, 1s. each; damaged, 5d. each. Coarse wools, 4d. per lb. Goat, 11½d. per lb.; heavy, 8¾d. per lb.; sundried, 9½d. per lb.; damaged, 4¼d. per lb.; bastards, 10d. per lb.; damaged, 3¾d. per lb. Angora, 7¾d. per lb.; sundried and heavy, 6¾d.; shorn, 5½d. per lb.; damaged, 2½d. per lb. Springbok, 9d. each. Johannesburg sheep, 4d.; damaged sheep, 3d.; pelts, 2¼d.; goat, 10½d.; damaged, 5¼d.; Angora, 6¾d.; damaged, 2¼d. per lb.

Hides.—Sundried, 9¾d.; damaged, 8¾d.; salted, 8½d.; damaged, 7½d.

Horns.—3½d. all round.

EAST LONDON.

Messrs. Malcomess & Co., Ltd., East London, report as follows, under date 1st May:—

Wool.—Since our last report dated 29th March, the coal strike has to all intents and purposes come to an end, enabling industry in general to get into its stride again.

Thus the London wool sales, postponed from 5th March, 1912, commenced on 11th April, with an approximate available quantity of 273,000 bales, of which 23,500 bales, South African.

The opening reports announced:—

Long light combings and scoureds ... ... Unchanged;
„ heavy „ „ ... ... Par to 5% lower;

short wools not being represented, which was a shade lower than the trade in general had expected.

This was supplemented by—

Long heavy grease ... ... Irregular, and fully 5 % lower ;
Short grease very scantily offered and hence unchanged :

since when cables have only read :—

"London wool sales are progressing unchanged."

There is no doubt a very considerable after effect which will be felt for a long time, and, though great pressure of work will naturally prevail in mills and factories to supply and deliver against running contracts interrupted in execution by the strike, this will be merely a false activity not indicative of a trade boom as so many say, but only a temporary spurt to catch up, after which we believe the trade depression naturally consequent on such a crisis will begin to make itself felt. Anyway we *don't* look to higher prices

Bradford remains about the same, spot parcels of usual 64's fetching round about 24¾d., occasionally the ¼d. under.

The *Continental Market* for washed products is practically unchanged, with manufacturers not in a speculative mood.

Locally there is not much to report, the comparatively small sales towards the end of the month being due to a difference between sellers and buyers, which, it is to be hoped, will soon be settled.

Quantities sold are as follows :—

2nd April, in public auction	—2200 offered	1100 sold.	Sales for the week, 2500
Easter week, in public auction	— — offered	— sold.	Sales for the week, 2000
17th April, in public auction	—4200 offered	1000 sold.	Sales for the week, 2500
24th April, in public auction	—2400 offered	150 sold.	Sales for the week, 1000
			8000

or with private sales of about 8000–9000 bales for the week, so that stocks are about 18,000 bales in town.

Transkei Wools being now in very large supply are not on such a high level as earlier in the season. Though exceptional lots can command up to 7d., the price for average lots is about 6¼d.

Up-country Shorts are often short, and generally faulty, containing burs and seeds, and also appearing heavier than last year owing to less rain.

Super Kaffrarian Wools do not promise quite so well as twelve months ago, as they seem to be lacking somewhat in the choice bloom and softness which is their chief characteristic.

We quote : —

	d.		d.		d.		d.
Transkeis	6	to	7	Good short well-conditioned grassveld	5	to	6¾
Basuto native grease	5	„	6	Short faulty grease	4	„	5½
Ordinary native grease	5	„	5⅞	Coarse and coloured	2½	„	4½
Superior short-skirted Kaffrarian farmers	7	„	8				

Mohair.—This article remains stagnant, spinners on the other side still holding out for a fall when the heavy new season's arrivals come in.

Really good N.S. Firsts are not likely to command more than 9d.–9¼d. at the Ports, against 11¼d. to 12¼d. at the corresponding season of last year.

It is possible even lower values may still obtain.

We quote :—

	d.		d.		d.		d.
Good new season's firsts	8	to	9¼	Seconds and greys	5	to	6
Superior new season's kids	14	„	16	Thirds	4½	„	5
Average new season's kids	12	„	13½	Basutos	8½	„	9½
Mixed O.F.S.	8½	„	9½				

Sundry Produce.—Hides, D.S., 8¼d. ; S.D., 10d. Goats, 11¼d. Angoras, 8d. Sheep 4¾d. for woolled skins ; 4d. for coarse woolled skins ; 2½d. for pelts ; 3½d. for Transkei parcels.

Current Market Rates of Agricultural Produce and Stock.

The following TABLE OF CURRENT MARKET RATES OF AGRICULTURAL PRODUCE AND LIVE STOCK on Saturday, 27th April, 1912, ruling at the several Centres named, is published for general information.

Centre.	A. Wheat per 100 lb.	B. Wheat Flour per 100 lb.	C. Boer Meal per 100 lb.	D. Mealies per 100 lb.	E. Mealie Meal per 100 lb.	F. Barley per 100 lb.	G. Oats per 100 lb.	H. Oat-hay per 100 lb.	J. Lucerne Hay per 100 lb.	K. Potatoes per 100 lb.	L. Tobacco (Boer Roll) per lb.	M. Beef per lb.	N. Mutton per lb.	O. Fresh Butter per lb.	P. Eggs per dozen.	Q. Cattle (Slaughter).	R. Sheep (Slaughter).	S. Pigs.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.	s. d.	£ s. d.
Cape Province:																		
Aliwal North ...	8 0	21 6	12 0	6 0	7 6	8 0	8 6	4 6	3 9	6 0	1 0	0 6	0 5	1 6	1 2	10 10 0	15 0	*2 0 0
Beaufort West ...	8 3	15 6	10 9	7 0	8 0	9 0	7 6	4 6	4 0	9 6	1 0	0 4	0 4	1 3	1 9	12 0 0	10 0	4 0 0
Capetown ...	—	—	—	—	6 3	8 0	6 8	4 0	5 3	10 0	†0 7½	—	—	1 3	1 9	—	—	—
East London ...	9 0	18 0	29 6	6 0	13 6	7 0	5 6	5 0	6 0	12 6	1 0	0 5	0 6	1 6	2 0	15 0 0	20 0	1 10 0
Grahamstown ...	8 0	—	—	7 6	—	4 9	7 3	4 1	—	12 0	0 9	0 5	0 4¾	1 5	2 3	—	—	—
Kimberley ...	8 6	12 6	11 3	5 6	6 6	7 0	7 0	4 6	4 0	11 0	0 5	0 6	0 5	1 1	1 9	12 10 0	14 0	3½d. p. lb.
Kingwilliamstown	7 0	18 0	12 6	6 0	6 9	5 6	8 6	3 3	4 0	11 0	0 9	0 6	0 6	1 3	2 0	12 0 0	19 0	3½d. p. lb.
Port Elizabeth ...	8 0	—	—	7 0	—	6 0	7 6	4 6	4 0	12 6	—	0 8	0 7	1 6	2 3	—	—	1 10 0
Queenstown ...	7 9	13 0	‡	‡	9 0	6 6	6 6	3 6	‡	8 0	‡	‡	0 5	1 4	2 0	‡	‡	‡
Natal:																		
Durban ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2 3	—	10 6	—
Pietermaritzburg	8 3	—	—	5 6	12 6	12 0	6 6	3 9	4 6	8 0	0 3	0 5	0 6	1 6	1 9	—	—	—
Transvaal:																		
Pretoria ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Johannesburg ...	7 9	—	10 6	§4 8	7 3	8 8	5 0	5 0	4 9	8 8	0 2	—	—	1 2	1 11	—	—	—
Orange Free State:																		
Bloemfontein ...	7 6	—	12 6	5 9	6 6	6 6	7 0	5 6	4 3	8 0	0 6	0 8	0 4	1 3	1 6	—	—	—
Harrismith ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

* Average (£1. 10s. to £2. 10s.). † Average (6d. to 9d.). ‡ Unchanged. § White: yellow, 4s. 9d.

Recent Proclamations, etc.

No. 52, 1912.]

PROCLAMATION

BY HIS EXCELLENCY THE RIGHT HONOURABLE VISCOUNT GLADSTONE, A MEMBER OF HIS MAJESTY'S MOST HONOURABLE PRIVY COUNCIL, KNIGHT GRAND CROSS OF THE MOST DISTINGUISHED ORDER OF ST. MICHAEL AND ST. GEORGE, HIGH COMMISSIONER FOR SOUTH AFRICA, GOVERNOR-GENERAL AND COMMANDER-IN-CHIEF IN AND OVER THE UNION OF SOUTH AFRICA.

WHEREAS it has been made to appear to me to be desirable to amend the regulations promulgated by Union Proclamation No. 323, bearing date the 20th day of December, 1911, defining the term "cleansing" and prescribing the form of certificate which shall require to be produced for the purposes and within the meaning of Cape Act No. 31 of 1908;

Now therefore, under and by virtue of the powers and authorities in me vested by the *tenth* section of Cape Act No. 31 of 1908 intituled the Cattle Cleansing Act, 1908, as amended by Act No. 43 of 1909, and by the *eighth* section of Union Act No. 11 of 1910, I do hereby proclaim, declare and make known that the regulations set forth in the schedule hereto shall be the regulations defining the term "cleansing" for the purpose and within the meaning of the said Acts and prescribing the form of certificate which shall require to be produced, in terms of Cape Act No. 31 of 1908.

And I do further declare that any person who shall contravene any of the regulations contained in the schedule hereto or any person who shall grant a certificate under Cape Act No. 31 of 1908 which shall be false or untrue in any material particular, or shall grant a certificate in respect of any animal which has not been properly cleansed in terms of the said regulations, shall be liable on conviction to a fine not exceeding five pounds sterling.

Union Proclamation No. 323 of 1911 is hereby superseded and cancelled.

GOD SAVE THE KING.

Given under my Hand and the Great Seal of the Union of South Africa at Capetown, this Fourteenth day of March One thousand Nine hundred and Twelve.

GLADSTONE,
Governor-General.

By Command of His Excellency the Governor-General-in-Council.

LOUIS BOTHA,
Minister of Agriculture.

SCHEDULE

TO THE FOREGOING PROCLAMATION.

Regulations under the Cape Cattle Cleansing Acts Nos. 31 *of* 1908 *and* 43 *of* 1909.

1. "Cleansed" cattle shall for the purposes and within the meaning of Act No. 31 of 1908, and Union Act No. 11 of 1910, mean cattle dipped or sprayed, so as to be visibly free from ticks.

2. The following shall be the prescribed form of certificate which shall require to be produced in terms of sections *four*, *seven*, and *eight* of Act No. 31 of 1908, viz.:—

I certify that on the..191... the undermentioned cattle were dipped or sprayed with an effective tick-destroying solution.

Number and general description of cattle.....................................
....

Name of owner or person in charge...
....

Place where dipped or sprayed..
....

Signature..
Qualification..

Place.......................................
Date..

The above certificate is to be signed by the owner of any farm on which a dipping tank is situated, or by the person in charge of any dipping tank, or by any inspector specially appointed for the purpose, field cornet, justice of the peace, sheep inspector, police officer, or landowner who is in a position to certify to all the facts as stated therein.

No. 63, 1912.]

PROCLAMATION

BY HIS EXCELLENCY THE RIGHT HONOURABLE VISCOUNT GLADSTONE, A MEMBER OF HIS MAJESTY'S MOST HONOURABLE PRIVY COUNCIL, KNIGHT GRAND CROSS OF THE MOST DISTINGUISHED ORDER OF ST. MICHAEL AND ST. GEORGE, HIGH COMMISSIONER FOR SOUTH AFRICA, GOVERNOR-GENERAL AND COMMANDER-IN-CHIEF IN AND OVER THE UNION OF SOUTH AFRICA.

UNDER and by virtue of the powers and authorities in me vested by the provisions of section *two* of Act No. 14 of 1911, entitled the Diseases of Stock Act, 1911, I do hereby proclaim, declare and make known that, from and after the date hereof, ostriches shall be deemed and taken to be stock for the purposes and within the meaning of the said Act and the regulations promulgated thereunder.

GOD SAVE THE KING.

Given under my Hand and the Great Seal of the Union of South Africa at Capetown, this the Twenty-eighth day of March, One thousand Nine hundred and Twelve.

GLADSTONE,
Governor-General.

By Command of His Excellency the Governor-General-in-Council.

LOUIS BOTHA,
Minister of Agriculture.

No. 114.] [22nd January, 1912.

MINISTER'S ORDER.

UNDER and by virtue of the powers in me vested by paragraph (*a*), section *sixteen* of Act No. 14 of 1911, I hereby order that no cattle shall be moved into, out of, through, or within the District of Glen Grey, of the Province of the Cape of Good Hope, except under such conditions as are prescribed by permit granted in accordance with the special regulations made under Act No. 14 of 1911, in respect of East Coast fever. Any cattle moved out of this district shall be branded if the Principal Veterinary Officer so requires.

This district shall for the purposes of the regulations, promulgated by Government Notice No. 1749 of 1911, be regarded as an East Coast fever area.

LOUIS BOTHA,
Minister of Agriculture.

Department of Agriculture, Pretoria.

No. 232.] [17th February, 1912.

MINISTER'S ORDER.

UNDER and by virtue of the powers in me vested by section *sixteen* of Act No. 14 of 1911, I hereby order that no cattle shall be moved into, out of, through, or within the Districts of East London and King-williamstown of the Province of the Cape of Good Hope, except under such conditions as are prescribed by permit granted in accordance with the special regulations made under Act No. 14 of 1911, in respect of East Coast fever. Any cattle moved out of these districts shall be branded if the Principal Veterinary Officer so requires. Each of these said districts shall, for the purpose of the regulations promulgated by Government Notice No. 1749 of 1911, be regarded as an East Coast fever area, and all and several the said regulations relating to East Coast fever areas shall apply thereto.

LOUIS BOTHA,
Minister of Agriculture.

No. 157.] [1st February, 1912.

GOVERNMENT NOTICE.

CATTLE MOVEMENTS, GLEN GREY.

WITH reference to Government Notice No. 114 of the 22nd January, 1912, it is hereby notified for public information that all

persons desirous of moving cattle from, into, or through the District of Glen Grey must first provide themselves with a permit to be obtained on application to the Resident Magistrate, Lady Frere.

These permits will be issued

(*a*) to bona fide residents for general movements of transport cattle to and from any specified railway station outside of the district which is generally used by the applicant; these will be available for a period of three months and subject to renewal on application and to summary cancellation should this be considered necessary;

(*b*) for single movements of cattle other than transport cattle which will only be granted on a sworn affidavit filed by the applicant to the effect that the said cattle have been on the farm or at the place from which it is proposed to move them for a period of three months immediately prior to the date upon which the application was made.

C. E. GRAY,
Principal Veterinary Surgeon.

No. 392.] [15th March, 1912.

GOVERNMENT NOTICE.

EAST COAST FEVER.

UNDER and by virtue of the powers in me vested by paragraph (*a*), section *sixteen*, of Act No. 14 of 1911, I hereby order that no cattle shall be moved into, out of, through, or within the Districts of Komgha and Stutterheim, of the Province of the Cape of Good Hope, except under such conditions as are prescribed by permit granted in accordance with the special regulations made under Act No. 14 of 1911 in respect of East Coast fever. Any cattle moved out of these districts shall be branded if the Principal Veterinary Officer so requires.

These districts shall, for the purposes of the regulations promulgated by Government Notice No. 1749 of 1911, be regarded as East Coast fever areas.

All persons desirous of moving cattle from, into, or within the Districts of Komgha or Stutterheim must first provide themselves with a permit to be obtained on application to the Resident Magistrate, Komgha, or Stutterheim.

These permits will be issued

(*a*) to bona fide residents for general movements of transport cattle within the districts and to and from any specified railway station outside of the district which is generally used by the applicant, available for a period of three months and subject to renewal on application and to summary cancellation should this be considered necessary.

(*b*) Permits for single movements of cattle other than transport cattle, which should only be granted on sworn affidavit filed by the applicant to the effect that the said cattle have been on the farm or at the place from which it is proposed to move them for a period of three months immediately prior to the date upon which the application was made.

LOUIS BOTHA,
Minister of Agriculture.

No. 527.] [13th April, 1912.

GOVERNMENT NOTICE.

UNDER and by virtue of the powers in me vested by paragraph (*a*) of section *sixteen* of the Diseases of Stock Act, 1911 (Act No. 14 of 1911), I do hereby issue the following prohibition with respect to the movements of swine in the Districts of the Cape, Paarl, Malmesbury, and Stellenbosch.

Swine fever having broken out in the above-mentioned area, no persons shall move, permit, or cause to be moved, any swine out of the area above mentioned, except under a permit granted by a veterinary officer of the Agricultural Department.

LOUIS BOTHA,
Minister of Agriculture.

Departmental Notices.

SCHOOL OF AGRICULTURE, POTCHEFSTROOM

VACATION COURSE IN DAIRYING.

A SHORT course of instruction in Butter-making, Cheese-making, and Milk-testing will be given for a period of five weeks from 17th June to 20th July (inclusive) Male students may reside in the Hostel. Charges for board and lodging for the whole period are £5 payable in advance.

Fuller particulars can be obtained from the Principal, to whom applications should be made.

ALEX. HOLM,
Principal.

Experimental Farm, Potchefstroom.

The Agricultural Journal

OF THE UNION OF SOUTH AFRICA.

Vol. III. JUNE, 1912. No. 6.

Issued MONTHLY in English and Dutch by the Department of Agriculture.
Communications to be addressed to the Editor, Department of Agriculture, Box 434, Pretoria.
Telegraphic Address: "Bulletin, Pretoria."
Subscriptions should be posted to the Government Printer, Box 373, Pretoria.
Advertising inquiries should be addressed to the Metropolitan Advertising Co., Box 962, Capetown.

Sugar Beet Investigation in the Cape Province.

By Dr. C. F. JURITZ, Chief Chemist.

IN the *Journal of the Royal Society of Arts* of 1st December, 1911, page 60, there appeared a short article on the "Yield of the sugar beet in Europe," based on the average production of sugar during the last five years in ten of the principal beet-growing countries of Europe. Statistics were given showing, *inter alia*, (1) the yield of raw sugar per acre of beet grown, (2) the percentage of raw sugar obtained from the crop, and (3) the weight of the crop per acre. The writer of the article expressed regret that Great Britain does not figure in the list of beet-growing countries, and asked whether this is due to ignorance or to apathy on the part of the inhabitants of the British Isles.

Some remarks were made by me in the *Cape Agricultural Journal* of November, 1910, on the sugar content of beet, and on the possibilities of sugar beet culture in South Africa. The subject is one that had aroused interest in various districts of the Cape Colony, and particularly on the part of some members of the late Cape Parliament. It is, therefore, scarcely necessary to make excuse for reverting to it and for placing before South African readers the statistics above alluded to relating to recent sugar beet production in Europe. The salient features of these statistics are to be found in the following table: —

Country.	Yield of raw sugar in cwts. per acre.	Percentage of sugar obtained.	Weight of crop per acre.	
			Tons.	cwts.
1. Germany......	39·0	16·32	11	19
2. Sweden......	34·6	14·95	11	10
3. Belgium.......	33·7	14·90	11	10
4. Denmark....	33·3	13·97	11	19
5. Austria-Hungary...	32·3	15·84	10	4
6. Holland........	31·3	14·96	10	9
7. Italy........	29·4	12·13	12	2
8. France........	28·0	13·18	10	12
9. Spain......	27·9	12·34	11	6
10. Russia....	19·4	15·57	6	5

In Germany, it will be observed, the production of sugar is greatest, namely 39 cwts. per acre, while Italy, although giving one of the lowest yields of sugar, produced, relatively to acreage, a larger crop than any other country.

In the course of my article in the *Cape Journal*, I summarized the few chemical investigations with regard to sugar beet that had been undertaken in the Cape Government Laboratories during the preceding thirteen years. I closed the summary with the statement that further investigations were being conducted at the Grahamstown Laboratory by Mr. Muller, and would be published in due course. Circumstances led to Mr. Muller's transference to Capetown, involving abrupt termination of the course of investigation which he had planned, but as far as they continued they are of interest, and time has therefore come to redeem the promise, although the investigations themselves are still incomplete. The present *Journal* appeals to a wider area of readers, and it has therefore been thought well not to confine this note to the later analyses of Cape sugar beets, but also to recapitulate the results previously published, and to add a brief résumé of the general discussion which accompanied them.

It is only just over 160 years since Marggraf, a Berlin chemist, discovered the red beet to contain sugar which he considered capable of being manufactured into the commercial article. On further investigation he found red beet to contain 4.6 per cent., and white beet 6.2 per cent. of sugar. Half a century elapsed ere these facts were turned to commercial account. Careful selection of mother beets and cultivation only of those whose analyses yielded highest contents of sugar gradually improved the sugar-producing qualities of successive generations of the plant to such an extent that the great German technologist, Professor Wagner, found individual beets with a sugar content of 12 per cent., and then expressed the hope that instead of so high a proportion of sugar being an exception, it might, in course of time, come to be the rule. The gradual realization of this hope Wagner himself witnessed, and in the eighth edition of his "Chemischen Technologie," published in 1870, he remarked:—

> The sugar beet has, in course of cultivation, been improved by many new methods of manuring, etc., until it yields 13 and sometimes 14 per cent. of sugar . . . Near Magdeburg, where the beet is extensively cultivated, the general results give—
>
> The greatest sugar production as 13·3 per cent.
> That from inferior beets as 9·2 per cent.
> The average beet yielding 11·2 per cent.

Thirty-seven years later, Professor Webber, speaking at Illinois on "The relation of Chemistry to Agriculture," said:—

> Individual beets have been grown with a sugar content of 20 per cent., and it is safe to say that in the best sugar beet countries the average content of sugar of beets delivered at the factories reaches 16 per cent.

In 1836 it required 18 tons of beets in order to produce one ton of commercial beet sugar. When Professor Webber delivered his address in 1907, more than a ton of sugar was produced from only 7½ tons of beets.

These facts are quoted to demonstrate the possibility under suitable cultivation of enormously augmenting the proportions of sugar capable of being yielded by this plant. But the best conditions cannot be obtained everywhere; for instance, the optimum temperature conditions for the production of beet containing a high sugar content do not prevail everywhere. In its *Farmers' Bulletin* No. 52, the United

States Department of Agriculture has published a map showing in which parts of the States the temperature conditions are such that sugar beet may attain its greatest perfection. These conditions are to be found existing in a belt of country stretching right across North America. Beginning with New York, it extends almost due west through Wisconsin to South Dakota; thence it takes a southerly course to New Mexico, and then turns north-west through Arizona and California, another zone branching off through Utah and Idaho to Washington. Those conditions do not obtain in Wyoming, although that State lies in a direct line with Idaho on the west and South Dakota, Wisconsin and New York on the east. In the south-eastern states too, Alabama, Florida, and Carolina, for instance, the best conditions are absent.

So too in South Africa we cannot expect the best conditions to prevail everywhere, and one object of the Cape investigations, sparse though they have been, was to ascertain in which parts of the country the highest percentages of sugar were capable of being produced.

The first investigations into the sugar content of beets that were undertaken in the Cape Government Laboratories were carried out in 1897, when a few plants were obtained for analysis from Mr. Halse, of Carnarvon Farm, Sterkstroom, and analysed in the laboratory at Capetown. The beets comprised four large specimens, averaging about 20 ounces in weight, and six smaller ones, weighing on an average about eight ounces each. For the purpose of determining the percentage of sugar, a uniform sample was prepared from the four larger beets, and another uniform sample representing the six smaller beets. The analytical results were as follows:—

	Sucrose (Cane Sugar) per cent.	Glucose (directly fermentable Sugar) per cent.
Larger beets.......... ..	15·98	·42
Smaller beets....	17·80	·45

Commenting upon these figures in my annual report for 1897, I observed:—

These results appear to be very satisfactory when compared with the following:—

In Germany the beet yields from 13·0 to 16·8 per cent of sugar

In the United States the beet yields from 12·0 to 15·1 per cent. of sugar.

In Victoria the beet yields from 12·0 to 17·0 per cent. of sugar.

It is right to mention that, for the cultivation of a good beet, the soil should be neither too heavy clay nor too light sand, nor should it contain much organic matter. Even lime tends to decrease the yield of sugar, whereas a potash fertilizer increases it, as the following results of experimental cultivations (in Germany) show:—

Sugar beet cultivated with potash manure yielded 16·8 per cent. of sugar.

Sugar beet cultivated with manure containing a large percentage of lime yielded about 7 per cent. of sugar.

It must be remembered that bulky beets are not the best sugar producers; they contain less sugar, as the above analyses show, and other products are formed in the beet which are detrimental to the successful extraction of the sugar juice. The matter is pre-eminently worth closer and experimental investigation, and, in connection with the subject of beet generally it must be borne in mind that the cultivation of beet and mangel-wurzel on land that has a tendency to brackishness goes far to remove from the latter the noxious salts that it contains.*

Eight years passed without any opportunity of further investigation presenting itself, but in 1905, during the course of an address

* *Cape of Good Hope Agricultural Journal*, vol. 27, 1905, p. 498, and Addresses and Papers Brit. and S.A. Assocns. for Adv. of Science, S. Africa, vol. 1, p. 229.

before the British Association for the Advancement of Science, I referred to the fact that in many of the soils in the Cape Colony lime is deficient, while, generally speaking, the soil of many districts is proportionately better supplied with potash than with any other plant food constituent.

Under these circumstances [I continued], recognizing the fact that, as European experiments have shown, sugar beet yields much more sugar in a potash than in a lime soil, it becomes a matter for experimental investigation whether crops of sugar beet cannot be grown profitably in places where the want of lime is an obstacle to successful fruit culture.

During that year (1905) investigations were begun in the Grahamstown Laboratory. Seed had been procured from Europe during the previous year from beet actually used there in the manufacture of sugar. This imported seed had been sown on a farm at Perseverance, near Port Elizabeth, and when mature (ten or eleven weeks after planting), in March, 1905, some of the beets were analysed and found to average 15.78 per cent. of sugar, the roots yielding this result weighing on an average 2 lb. 7¾ oz.

In August, 1908, nine samples of sugar beet were procured from a farm in the Kingwilliamstown Division. These beets were grown from some of the seed which had been sent to Kingwilliamstown from Port Elizabeth. Five of the beets were classed as small, three as medium, and one as large, and their weights were as follows:—

	Minimum	Maximum.	Average.
Small......	2 lb. 9½ oz.	2 lb. 15 oz.	2 lb. 10½ oz.
Medium........	3 lb. 6½ oz.	3 lb. 15 oz.	3 lb. 10 oz.
Large........	4 lb. 5¼ oz	4 lb. 5¼ oz.	4 lb. 5¼ oz.

The dimensions of the roots (in inches) were as shown below:—

	LENGTH.			CIRCUMFERENCE.		
	Min.	Max.	Average.	Min.	Max.	Average.
Small..............	11	13½	12	12¾	14¼	13¼
Medium.......	10	13	11	14	15½	14¾
Large.........	12	12	12	15¾	15¾	15¾

The small beets contained an average of 9.87 per cent. of sugar, the medium beets 9.23 per cent., and the large beets 10.41 per cent. A general analysis of the smaller beets with respect to their nutritive value resulted in the following figures being obtained:—

	Per cent.
Moisture....................................	85·09
Sugar..	9·87
Crude fibre....................................	·79
Proteins..	2·23
Ash, pectin matters, etc......................	2·02

On account of the great difference in sugar content between the Kingwilliamstown beets and those grown at Port Elizabeth, a sample of the soil on which the former were grown was obtained and analysed both mechanically and chemically. The mechanical analysis of the soil, after drying to expel all moisture, yielded the following results:—

		Per cent.
Pebbles	> 3 mm.	·96
Coarse gravel	3 — 2 mm.	·39
Fine gravel	2 — 1 mm.	·75
Coarse sand	1 — ·5 mm.	·55
Medium sand	·5 — ·25 mm.	33·84
Fine sand	·25 — ·1 mm.	26·70
Very fine sand	·1 — ·05 mm.	8·03
Silt	·05 — ·01 mm.	16·30
Fine silt	01 — ·005 mm.	7·03
Clay	< ·005 mm.	5·37
		99·92

These figures may be more broadly summarized as follows:—

		Per cent.
Pebbles	> 3 mm.	·96
Gravel	3 — 1 mm.	1·14
Sand	1 — ·05 mm.	59·12
Silt	·05 — ·005 mm.	23·33
Clay	< ·005 mm.	5·37

The soil may therefore be classed as a sandy loam.

The chemical analysis of the soil yielded the following figures:—

Percentage of soil sifted through 1 mm. sieve.

Water	·57
Organic matter	2·04
Chlorine	·0035
Nitrogen	·070

Percentage of soil sifted through ½ mm. sieve.

Lime	·012
Potash	·042
Phosphoric oxide	·053

Both mechanical and chemical analyses were carried out according to the standard methods detailed in my "Agricultural Soils of Cape Colony," pp. 193-195 and pp. 13-15. The figures show the soil to be very poor in its reserve store of plant food—lime, potash, and phosphates are all lacking, and the need of general manuring is indicated. The soil on which the beet with much higher sugar content had been grown at Port Elizabeth had not then been analysed, but it should be noted that, irrespective of any difference in their sugar percentages brought about by difference of soil, the Port Elizabeth (Perseverance) beets had been grown as a summer crop, while the poorer Kingwilliamstown beets had matured during winter. But in February of the following year (1909) some beets grown during that summer near Bedford were taken for analysis, and in these the percentages of sugar were even lower than in the winter crops from Kingwilliamstown. The Bedford beets were divided into two classes; the smaller beets averaged 2 lb. 1¾ oz. in weight, and yielded 8.05 per cent. of sugar; the percentage of sugar in the larger beets, which weighed on an average 3 lb. 2¼ oz., being 6.09 per cent.

Analyses were subsequently made of the soil from Perseverance, where the beets of high sugar content were grown, and below—side by side with these—are given the results of analyses of the Bedford soil which yielded the beets poor in sugar:—

		Perseverance.	Bedford.
Mechanical Analysis:—			
Pebbles.................	> 3 mm.	·03	·09
Coarse gravel...........	3 — 2 mm.	·02	·15
Fine gravel.............	2 — 1 mm.	·09	·77
Coarse sand.............	1 — ·5 mm.	·65	1·04
Fine earth..............	< ·5 mm.	99·21	97·95
Chemical Analysis:—			
Water...................		1·07	2·12
Organic matter..........		5·16	4·35
Chlorine................		·026	·013
Nitrogen................		·265	·235
Lime....................		·172	·286
Potash..................		·090	·090
Phosphoric oxide........		·077	·089

The only appreciable difference between the Port Elizabeth and Bedford soils revealed by these figures is in respect of their lime content. Both soils are rather low in potash—in fact, probably too low for beet—so that the good results obtained on the Perseverance soil were probably in spite of, rather than because of, its provision of plant food, and are due no doubt to manuring.

Towards the close of the year 1909 experimental sowings were carried out in the Coombs Valley, Albany Division, but the crops proved abortive owing to the prevalence of insect pests. In 1910, however, a winter crop was grown in the same locality, and seven samples were taken for analysis. The results obtained are given in the following table:—

Grade.	Weight.		Circumference.	Length.	Sucrose.
	lb.	oz.	inches.	inches.	per cent.
Small.....................	2	0	14¼	6¾	12·03
Small.....................	2	7	11¾	9½	11·71
Fair......................	2	11	13⅝	8	10·75
Fair......................	2	11½	15½	6	12·02
Fair......................	2	12	13¾	7½	
Medium....................	3	2	14	9¼	13·90
Medium....................	3	4¾	14	10⅝	10·76
Large.....................	3	13	16½	9⅞	6·33
Large.....................	5	2	16	11½	

The two largest beets were obviously over-matured. As for the others, the average percentage of sucrose found in them was 11.86, and it is probable that this figure would have been higher had the samples been taken at least two or three weeks earlier.

The Grahamstown investigations, carried out by Mr. Muller, ceased early in 1911 (February) with the analysis of thirteen beetroots from Graaff-Reinet. Through some mischance the beets were not, as had been the case with the previous samples, *absolutely* fresh

on arrival in the laboratory. They were graded into four groups and yielded the following figures:—

Grade.	Weight.		Sucrose.
	lb.	oz.	per cent.
Small	0	10	
Small	0	14	17·57
Small	0	14	
Fair	1	10	
Fair	1	15	
Fair	1	10	
Fair	1	3	17·50
Fair	1	7	
Fair	1	2	
Medium	2	6	16·96
Medium	2	10	
Large	3	3	16·30
Large	4	2	

All the above results we e obtained from the eastern districts of the Cape Province, but the analyses of beets grown in the western districts, with widely different climatic conditions, have shown it to be possible that there too beet may mature in such a way as to produce a maximum of sucrose. But they likewise show that in the western districts also the requisite conditions for obtaining such a maximum must be fulfilled, and that poor results, like those of Bedford above given, are by no means confined to the east.

Of the samples examined in the Capetown Laboratory two grown at Woodstock were low in their sugar content. One of these, examined in 1905, contained only 7.7 per cent. of sucrose (cane sugar); another, analysed during 1906, contained even less, namely 5.28. About the same time some beet which had been grown at Tulbagh from American seed, yielded 16.3 per cent. of sugar, whereas other samples also grown at Tulbagh, but on soil of a different type, gave only 9.7 per cent. Then again beets grown not very many miles distant at Over Hex River, on the Karroo soil of the Worcester Division, realized a sugar percentage of 15.5.

The need of collecting the beets at the right time was exemplified above in the case of the two large samples from Coombs Valley, which were allowed to get too old before they were pulled up, and in consequence their sugar content had diminished. The opposite error, that of collecting the beets too early, was exemplified in two lots grown by Senator the Hon. Dr. Viljoen at Oak Valley, in the Caledon Division, during 1906 and 1907; the former lot yielded only 5.64 per cent. of sugar, but the latter as much as 17.77 per cent.

It must not be imagined that all the sucrose contained in the beets is capable of extraction. The amount of *crystallizable* sugar present may be considerably less than the total sugar percentage. Those connected with the beet-sugar trade will tell you that the glucose in the juice inverts twice its weight of sucrose, and the ash inverts five times its weight. So it is necessary to deduct from the total percentage of sucrose twice the weight of the glucose and five times the weight of the ash; the difference will then be the amount of crystallizable sugar in the beets. Hence, to have an idea of the

quality of sugar beets determinations of glucose and of ash are also needed. In Europe and America it is usually considered good work to obtain from 11 to 13 per cent. of their weight of cane sugar from beets.

Another point worth remembering is that the sugar is not uniformly distributed in all parts of the beetroot. Floderer and Herke have recorded* the results of a series of investigations made by them which show that most of the sucrose is accumulated in the interior portion of the root, about the level where it commences to taper. The smallest amount of sugar is found in the uppermost part of the root, and the next smallest at the lowest extremity of the root. They carried out their investigations by first of all cutting a number of large roots of uniform size into ten transverse sections, as shown by the numbers 19, 9, 7, 6, 3, 2, 8, 11, 16, 18 in the appended sketch, and then further sub-dividing the six middle sections—9, 7, 6, 3, 2, 8—each into concentric rings. The roots were thus divided into nineteen pieces each, which were analysed separately, and thus it was found that the proportion of sugar was greatest in the portions of the root marked 1 and lowest at the part marked 19, diminishing in the order of the numbers as indicated in the sketch.

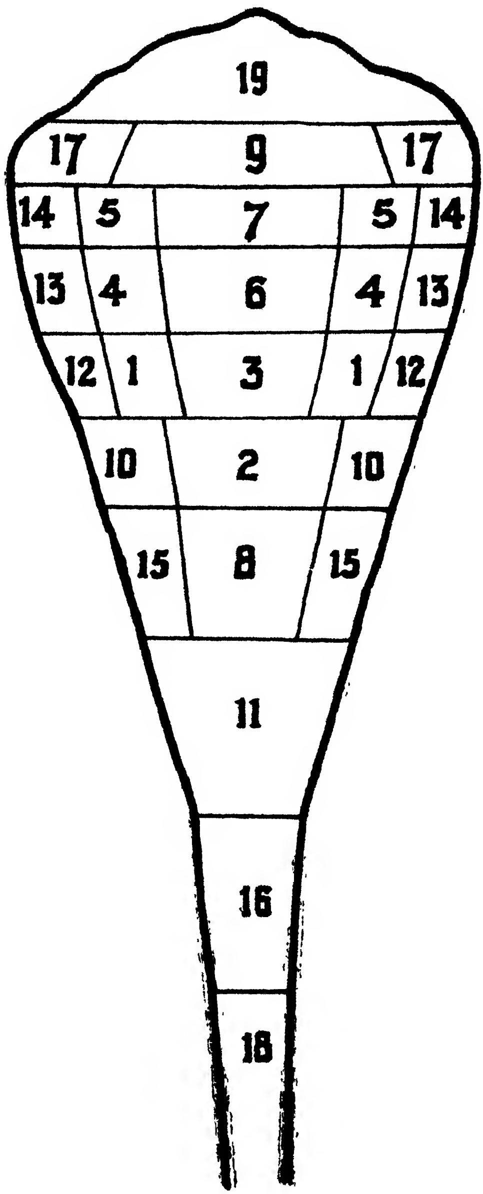
After the beet has been exhausted of its sugar by extraction with water the residue still constitutes a valuable cattle food. In addition, an excellent feeding material is produced as a by-product in the form of molasses.

With regard to the practical growing of beet, either for stock feeding or as a source of sugar, relatively little has been done experimentally in South Africa. The chemical aspect of the question at all events has not been approached from that side. Before his departure from the Cape Colony Dr. E. A. Nobbs, now Director of Agriculture in Rhodesia, started some beet experiments at Molteno, Knysna, and the Cape Flats. The last of the three was a failure, but in the other localities the beet grew well—at Knysna until it was overtaken by the summer drought, and at Molteno though damaged by locusts and other insects. To what extent the diverse climatic conditions in different parts of South Africa affect the percentage of sugar is a point not yet investigated. That they do so affect it seems evident from the chemical analyses that have hitherto been made, but those results need following up. That climatic conditions in general exert such an effect is shown by the existence of those belts of country above alluded to in the United States, where the conditions are found most favourable for the culture of beet of high sugar content. Professor Maercker, the eminent German agricultural chemist, also gave it as his opinion that a suitable climate is the first requisite for the remunerative cultivation of the sugar beet, and though he said that, in the second place, a suitable soil must be available for the purpose, and that such a soil should be warm with a warm sub-soil, yet, after dwelling on the importance of a sufficiency of lime in the soil, he added that there is no kind of soil—with the exception of the driest sand drifts—on which the sugar beet may not be successfully cultivated if only we understand what are the measures necessary to make it thrive.

Dr. H. W. Wiley, Chief of the United States Bureau of Chemistry, came to the conclusion, as a result of several years special

* *Osterr.—Ungar. Zeits. Zuckerind. und Landw.*, 1911, pp. 385–397.

investigation of sugar beet culture, that there is a distinct and marked relation between temperature and the sugar content of the beet. As the temperature rises, he found, the content of sugar falls. The altitude also materially affected the proportion of sugar in beet. His



investigations further showed that a high sugar content resulted in a greater purity of the juice.

With regard to soil, Dr. Wiley's conclusions were that, when excess of plant food tended to produce overgrowth, the proportion of

sugar in the beet diminished; on the other hand, the sugar content slightly increased when the amount of plant food in the soil was insufficient to produce normal growth. For the latter reason too, small beets were richer in sugar than larger roots. So also, when nitrogenous fertilizers were used, both as nitrates and as organic nitrogen compounds, leaf development and root growth became emphasized, and thus, while increasing the tonnage, the proportion of sugar in the individual beet was diminished. Phosphatic and potassic fertilizers, on the other hand, increased the sugar in the beets. It was in any case evident that a system of manuring that produced a larger crop would cause an almost corresponding increase in the total sugar *per acre*, whatever the result might be as regards the actual sugar *in the beet*.

Maercker clothed his ideas in somewhat different language when he said that—

Formerly the sugar factories demanded quite excessive quantities of phosphoric acid, with the object of obtaining beets rich in sugar. They required fifty to ninety pounds and upward to the acre, and they believed that not only was this necessary in order to obtain heavy crops of beets, but also that the quantity of phosphoric acid stood in direct relation to the formation of sugar in the beet. This idea has been set aside by Hellriegel, who has proved that no connection exists between the phosphoric acid and the formation of sugar in the beet. On a soil poor in phosphoric acid you will indeed grow fewer beets than on one rich in phosphoric acid, for phosphoric acid is an indispensable food-stuff of the beet: but the crop of beets, although smaller in quantity, is relatively as rich in sugar as that of which the quantity is greater.

With the above results before us, it is no longer doubtful whether this country can grow beet containing a sufficiently high percentage of sugar. It can do that. But whether beet crops of high sugar content can be grown in sufficiently large quantities to make sugar extraction commercially profitable is not thereby answered affirmatively.

The commercial aspect of the matter was discussed at some length in my former article, to which I would refer all who desire more detailed information than seems necessary to repeat on the present occasion. It may, however, be summarized in a few words. It is fair to assume that the financial aspect will present more serious difficulties in South Africa than in England, and so it becomes *apropos* to quote a remark made by the Right Hon. the Earl of Denbigh in an article on "A British Beet Sugar Industry," written by him six years ago. His lordship considered it a great mistake to start a factory that could not deal with 30,000 to 40,000 tons of roots per annum, and so he thought that to make a beginning with any hope of commercial success a capital of from £70,000 to £80,000 would be needed. Lord Denbigh, at the same time, did not venture to doubt the *agricultural* possibilities of the industry, for, writing to Mr. Chiappini, he expressed the view that success would mean entirely a matter of soil, climate, and labour, and that there would doubtless be many places in South Africa where loamy soil and abundant sunlight would enable the roots to do well.

Mr. G. L. Courthope, M.P., speaking at the British Association Meeting in 1910, estimated a capital of £120,000 necessary for starting a factory that was capable of dealing with 500 tons of beets per day, that is to say, with the output of about 2000 acres.

Mr. A. D. Hall, M.A., F.R.S., of Rothamsted, apprehended no difficulty about growing beet of good agricultural quality in South Africa, but doubted whether it could be done with a profit to the

sugar maker. All costs of growing amounted, in the south of England, to about £13 per acre at a time when German factories were paying from 15s. to 19s. 6d. per ton for beet which was being produced at the rate of about 12 tons per acre on highly farmed land.

A few years ago experiments in beet cultivation were made on the Liverpool Corporation sewage farms, where a yield of 43 tons of sugar beet per acre was realized. The beet contained over 17 per cent. of sugar on an average, and by selling the beets at £1 per ton a profit of £6. 10s. per annum per acre could be made by the farmer.

And now I may repeat a remark previously made by me, that in South Africa both convenient acreage and sufficient capital should be available for such an industry as this, but the question is whether, if the acreage be found, some other crop easier to cultivate may not shunt the beet on account of yielding a more abundant profit than the latter, and in that case the capital would naturally be speedily diverted from the beet. So that, however promising the scientific results may be, in the last resort it is the commercial aspect that will determine the issue.

Facts and Theories about Stijfziekte and Lamziekte.

By Dr. A. Theiler, C.M.G., Acting Director of Veterinary Research.

(Part III.)

THE STIJFZIEKTES OF SOUTH AFRICA.

The term "stijfziekte" is frequently used in South Africa to designate certain symptoms and conditions in cattle, the nature of which is indicated by the name itself. It describes an affection of the locomotory organs, embracing almost anything interfering with the normal movement of the limbs up to a complete paralysis. Experience has shown that there are quite a number of ailments in cattle which may affect the movement of the animal, and it depends very much on the opinion of the observer whether he calls such an impaired action "stijf" or "lam." Accordingly, the very names may become misleading in the description of the disease which, perhaps, has nothing to do with those forms of stijfziekte under consideration. This fact has been brought home to me since I started my personal investigations and inquiries.

Some years ago the disease in cattle known as "Three Days' Sickness" swept through South Africa. It was generally called stijfziekte and lamziekte, and these names would have been quite appropriate if they had not already been used for other diseases. The symptoms of stiffness and subsequent apparent paralysis were so much pronounced that, to the inexperienced, they caused much alarm. At that time, when speaking of stijfziekte and lamziekte, one had to make clear at the very outset what disease was meant, the new one or any of the old ones known by that name. In the course of my recent investigations but little reference was made to the "Three Days' Sickness" except that it was mentioned in some instances still to exist in certain parts of South Africa, a statement which, however, I was not able to verify. Most of the farmers had already forgotten its previous invasion and the anxiety it caused then. Accordingly, when speaking about stijfziekte and lamziekte, the diseases were meant which, before and after that time, were known under these names. In Bechuanaland, and also in the Orange Free State, the name "gal-lamziekte" is frequently used. It applies to a severe form of lamziekte. It does not designate a new disease, although a good many farmers are inclined to believe that the old lamziekte now shows new and more severe symptoms, and is of a more virulent nature. From the notes on this disease by Dr. Hutcheon (which he mentioned as gall-sickness) we will notice that he was familiar with it at an early date. In his later reports he does not distinguish it any longer and also

calls it lamziekte. In using the terms stijfziekte and lamziekte it will be necessary to give the symptoms and lesions found in the diseases they designate. I am at present more particularly dealing with stijfziekte, and shall leave lamziekte for a future consideration. At the present time there appear to be at least three diseases which go under the name of stijfziekte, into the nature of which I will now enter.

I.—THE STIJFZIEKTE CAUSED BY THE STIJFZIEKTE BOSCHJE (*Crotolaria burkeana*). THE CROTALISM OF CATTLE.

This stijfziekte was described by me in the first number of the *Union Agricultural Journal* as a laminitis of cattle, the seat of the affection having principally been found in the horn-forming membrane of the hoofs. As a result of an acute inflammatory process the animal walks on its heels, with the forelegs placed forward and the hindlegs put underneath the abdomen, with the back arched, and showing much pain, like a foundered horse when forced to walk. As a result of this, the toes of the hoofs lose touch with the ground and begin to turn up, the digits separate and grow out. Frequently the skin around the coronary pedal joints forms a groove, the axis of the distal end of the foot which, from the fetlock to the hoof, should run in a straight line, having a distinct kink. Underneath the coronet in the wall of the hoofs a shallow groove or a ring is formed, narrow in front and gradually broadening out on the side as it progresses downwards. There may be a succession of grooves or rings. In the course of events the toes of all four feet turn up and grow out; sometimes this is more prominent in the hindlegs and on other occasions more in the forelegs. The hoofs of the hindlegs seem to remain abnormal much longer than those of the forelegs. The grown-out horn may disappear as a result of being worked down through walking, when the hoofs again take to their former shape and the gait of the animal becomes normal once more. This does not always take place, and even when the hoofs are sawn or cut down the gait does not of necessity regain its normal action: the hoofs remain turned up and the toes commence to grow out again.

During the acute state of the attack, the hoofs are warm, they appear more bright in colour, and when normally of white horn they may even have a reddish hue. When percussed with a stone the animal shows pain by withdrawing the foot. The alternate lifting of the feet and changing of the weight of the body from one side to the other are the first symptoms, and such animals show the characteristic laminitic walk. In this stage the animals frequently lay down, they lag behind the rest of the herd, and begin to lose in condition. Later the pain in the feet seems to lessen, the animals still walk stiffly, and after the hoofs have grown out there seems to be not so much pain, but there is mechanical interference of the long toes with the gait, the animal lifting the legs somewhat abnormally, and a peculiar rattling noise becomes audible, particularly when the animals are driven on, due to the sound of the dry horn touching the ground.

This disease does not, as a rule, lead directly to death, but indirectly, inasmuch as some of the animals through not being able to walk about lose so rapidly in condition that later on they are unable to rise, and die of debility or starvation.

The *cause* of this stiff-sickness has been experimentally established by feeding of the so-called "stijfziekte boschje" (*Crotolaria burkeana*). These experiments were made in two different places in the Transvaal, viz., in Barberton and in Zeerust. It is true that in some cases large quantities of the plant were fed. This was done to make sure that the plant was poisonous, but also, when smaller quantities of the herb were used after the lapse of only a few days, the disease developed. Accordingly there is no doubt that the stijfziekte which I described above is caused by the plant *Crotolaria burkeana.*

The article in question in the *Agricultural Journal* dealing with this stijfziekte drew the attention of many farmers to this plant. They were on the lookout for it; some found it, and in sufficient quantities, so that its presence would account for the presence of the disease on their farms. Some, however, found it in such rare numbers that it could hardly be connected with the disease, and a good many more did not find it at all and yet they had a disease, stiff-sickness, amongst their cattle, and sometimes even in an alarming manner.

This fact was brought to my notice from answers in the query sheet issued for the purpose of information concerning lamziekte in cattle, by correspondence and verbal discussions with farmers, and it forced me to the conclusion that as a cause of stijfziekte there must be other plants responsible, and that not all stijfziektes are identical. It is possible that even other causes than plants may play a role.

Personal observations convinced me of this fact when visits were made into the various parts of South Africa inquiring into the nature of the disease under discussion.

II.—STIJFZIEKTE NOT CAUSED BY CROTALARIA, FREQUENTLY COMPLICATED WITH JOINT LESIONS.

In this form symptoms similar to those found in the acute laminitis as caused by crotalaria may be present. The animal walks exactly in the same way, with arched back, taking short steps, keeping the fore feet forward and placing the hind feet underneath the abdomen; the digits separate and grow out, and they may even grow out to some length. Rings appear underneath the coronary band and the horn seems to be brighter in colour. Although in these respects the disease resembles crotalism very closely, so far I have not yet seen a case where a turning up of the digits has taken place and is so pronounced as in the former disease. The hoofs seem simply to grow longer and to broaden out toward the toes, but the toes remain in touch with the ground, and after the attack is over the abnormal length is worked off by walking, normal conditions returning. Frequently, however, an animal is marked forever by the abnormal length of the toes and by the turning in of the walls on the side. It seems also that in this second form of stiff-sickness the animals do not go down so much on their heels as in crotalism, which accounts for the toes not turning up.

The animals in the acute stage also lie down frequently, lag behind, and lose in condition.

The symptoms in the hoofs pointing to the seat of the attacks may be present alone, frequently, however, there are other lesions present pointing

to an affection of the distal joints and particularly the fetlock joint seems to be the one most affected. Examining it from the front, it seems enlarged, and on both sides, inside and outside, between the bone and the flexor tendon, a growth of the bone bulges out like windgalls in the horse. These tumours are hard, and are nothing else than a diffuse thickening of the lateral portion of the distal end of the bone.

Attention must be drawn here to the fact that in young animals, about one to two years old, principally in oxen and more particularly in animals crossbred from Africander with imported bulls, and very noticeable in the Friesland breed, prominent joints and thick ends of the canonbones are noticeable. In stiff-sickness, however, this swelling is so to say exaggerated and can be recognized without difficulty in the Africander breed where the bones are not so heavy and the joints not so thick.

In some cases the thickening can lead to an abnormal form and shape of the joints, the coronary joint underneath may also be involved and the whole distal end of the foot looks abnormally thick.

These joint lesions may or may not be accompanied by abnormal growth of the hoofs. Their presence causes stiffness and lameness similar to the laminitic form of stiff-sickness or crotalism, but usually not so pronounced, it is noticeable when the weight of the body is placed on the limb, when pain is felt and the animal strives to relieve the leg as quickly as possible. Hence the short and quick steps. So far the post-mortem examinations have shown that the joint itself is not affected, it is the lower end of the canonbone the epiphyses, which are enlarged to a hard and solid diffuse tumour. Cutting into it did not show any softness · it was hard, and the same resistance was felt as when an attempt was made to cut normal bones with a knife. Not only thick joints can result from this disease, but also abnormal position of the legs can be noticed. Some animals become pronouncedly knockkneed, so much so that in walking the knee-joint of the one touches that of the other leg, or in the hindlegs the hocks may turn inwards and the feet outwards; in other cases the distal ends of the legs, from the fetlocks downwards are turned in an outward direction. Other joints, viz., knee-joint and hock may be enlarged, and sometimes the canonbones show thickening. Bending of the canonbone can be noticed and as a result of this an abnormal gait develops.

The animals so affected show unthriftiness, they are stunted in their growth, remain small, have a rough coat and they develop a big abdomen.

This disease affects young stock, heifers and tollies, and cows with a calf at foot. It begins to show itself particularly soon after calving, viz., within a month. When the calves are taken away and the cows are not milked they seem to recover more quickly. The same animal may at the next subsequent calving show the disease again. It has been stated that oxen used in transport and harnessed in the plough are not at all or at least much less susceptible to stiff-sickness. Also old animals develop this disease sometimes, although the younger ones are generally admitted to be those principally affected.

I have seen this form of stijfziekte in cows, heifers, and tollies in Bechuanaland, in heifers of the Western Transvaal, in calves of the Mafeking district, in cows on a farm in the district of Bloemfontein, in young

heifers near Stellenbosch, in cows and oxen up to four years of age in Grahamstown, and lately in Middelburg in the high veld, Transvaal. I am also informed that it is present in Natal, and the description given to me, at least seems to support this view.

From two places in the high veld cows suffering from the acute stage (before any changes in hoofs or joints had resulted) were brought to the Onderstepoort laboratories, where they were kept for the purpose of close observation. These animals showed the characteristic gait. They were both stiff, viz., had the foundered walk and both had lost in condition. Soon after their arrival they seemed to improve, they put on flesh and after the sojourn of a few weeks they had recovered. They now walked freely and showed no pain. The disease in the high veld of the Transvaal was noticed by the Government veterinary officers and brought to my notice in the districts of Middelburg, Lydenburg, Carolina, Ermelo, on some farms in Standerton, and also in the district of Pretoria. It is likely to exist in many other districts.

An interesting observation was made that the disease is only found on certain farms and not on others. Moving of the cattle from such farms to healthy farms stops the spread of the disease and helps to arrest the development in those already affected. It has also been stated that on such farms where the disease is rather bad, an unusual craving for bones and refuse on the ash-heap is shown and that notwithstanding a liberal supply of bonemeal and salt it is still met with.

On some farms a few cases were noted during the last five or six years, but owing to their scarcity no notice was taken of the disease. During the last two years and perhaps more so during the last year, losses have become more frequent and some farmers are inclined to connect this fact with shortage of the rainfall or with the absence of well-distributed rains during this period.

Up to the present the information as to the nature of the pasture of the farms on which the disease has been found was uniformly given as that of sour veld, and it is stated that it is not found on sweet veld; a movement from the former to the latter is considered of beneficial influence. Although the sour veld is the dominant character of the high veld, yet the disease is not met with on all farms and it is a curious fact that in one and the same neighbourhood of farms adjoining each other, with apparently the same grass, one farm is badly infected with the disease and another is absolutely free. Farms in valleys do not seem to be infected. Some of the farms on which the disease was noted were carefully examined by the farmers themselves, by the Government veterinary officers, and by the Botanist, Mr. Burtt-Davy. *Crotalaria burkeana* could not be found and this fact brings home the conclusion that the disease must be due to other causes. The question naturally arises whether the two forms of stijfziekte, the foot and the joint form, as described now under the title of the second form of stiff-sickness, are identical, or whether here also separate causes are responsible for the different lesions. At the present time I am inclined to consider both to be due to the same cause. My reason for this opinion is the fact that both forms are usually met together on one and the same farm, and occasionally in one and the same animal. It seems to me,

however, that in female animals the hoofs are the seat of predilection whereas in tollies more frequently the distal ends of the canonbones are affected.

A definite decision will only be possible once the cause is known and the disease can be produced experimentally.

Non-identity of this Disease with Lamziekte.

This second form of stijfziekte is, to my mind, undoubtedly identical with one that has been described by the late Dr. Hutcheon, whose notes I have given in detail. In comparing my observations with his there is practically no difference as far as the joint form is concerned. Concerning the affection of the feet, we notice that Hutcheon does not draw the attention to the turning up of the toes.

I do not now think that Hutcheon ever saw the form I described in the first number of the *Union Agricultural Journal*, and which is caused by crotalaria, and I must admit that the form which I have described just now, and which I consider identical with Hutcheon's, was never before brought to my notice. It only came to my knowledge subsequent to the publication of my first article, as a result of visiting many farms in connection with lamziekte, and as a result of correspondence with Government veterinary officers and farmers. The reason for the misunderstanding is an obvious one. In certain stages both diseases resemble each other so much that a differential diagnosis is not always possible without actually going into all the conditions under which they are met with.

This second form of stijfziekte which for convenience' sake, until we have a better name deducted from the cause, I shall call the complicated form, is considered by Hutcheon to be identical with lamziekte, viz., to be one form of lamziekte, and the reasons for this view are clearly exposed in his own words in the first part of this article. The main reason perhaps is the fact that Hutcheon, in his investigations, met this disease practically on all such farms where lamziekte was known to exist at one or another time; if both were not together at the same time the stijfziekte was usually the first to be noticed, and on such farms the craving for bones was usually very noticeable, and subsequently the lamziekte was reported to appear or to have appeared.

In my own investigations I met this second or complicated form of the disease for the first time in the lamziekte area, and on a farm on which the latter disease was reported to be very prevalent. Subsequently it was reported on farms on which there was never any lamziekte at all, and finally it has been found to be prevalent in the Eastern Transvaal, in the high veld, and in Natal, on farms where there is no history of lamziekte. This fact, therefore, warrants the conclusion that the second or complicated form of stijfziekte is not connected with lamziekte.

Cause of the Disease.

The conclusions Dr. Hutcheon had arrived at was that this form of stijfziekte, like that of lamziekte, was due to the want of phosphates in the foodstuffs. From Dr. Hutcheon's description of the disease, as well as from mine, it will be seen that this second form of stijfziekte resembles, to a certain extent, the diseases rickets and osteomalacia in cattle, and

Hutcheon, indeed, identified the latter with stiff sickness. In order to explain the swellings of the epiphyses, the deformation of the joints, the thickening of the bones, and the distortions of the limbs themselves, a softening of the bony substance may be accepted, during which period the weight of the body may lead to these deformations, and it may be that whilst the acute process is proceeding there is a deficiency of phosphates of lime in the altered parts. If stiff sickness is identical with osteomalacia, then the want of the mineral salts is not limited to the affected bones alone, but the whole skeleton must show a shortage. Accordingly we except that an analysis of the bones of stijfziekte animals will give us this information, and a comparison with the analysis of healthy bones will show differences. For comparison's sake the result of analysis of the bones of animals suffering from crotalism are repeated here. The analyses were undertaken by Messrs. McCrae (complicated form), Ingle (crotalism and normal, Nos. 543 and 569), and Vipond [normal (three) and debility]

Extract of Analytical Results

No. of Animal.	Disease	PHOSPHORIC OXIDE TO ASH.	LIME IN BONES.	PHOSPHORIC OXIDE TO LIME.		LIME IN HEALTHY AND DISEASED.		PHOSPHORIC OXIDE IN HEALTHY AND DISEASED.	
		Percentage of phosphoric oxide in 100 parts of ash.	Percentage of lime present in 100 parts of ash.	Ratio.		Ratio.		Ratio.	
				Phosphoric oxide.	Lime.	Normal.	Diseased.	Normal.	Diseased.
		%	%						
2020	Joint form.......	39·93	56·68	1	1·453				
2022		41·55	56·35	1	1·356				
2023		41·50	57·47	1	1·385				
		122·98	170·50						
	Mean.......	=40·99	=56·83			1	1·05	1	0·97
563	Crotalism........	41·42	55·85	1	1·348				
568		40·85	55·76	1	1·365				
		82·27	111·61						
	Mean.......	=41·13	=55·80			1	1·03	1	0·98
543	Normal..........	41·5	55·21	1	1·330				
639		44·6	52·85	1	1·183				
3		40·2	54·17	1	1·341				
		126·3	162·23						
	Mean.......	=42·1	=54·08						
4	Debility.........	39·8	53·78	1	1·351	1	0·99	1	0·95

The comparison of the analyses of the bones of three healthy cattle show the minimal percentage of phosphoric oxide in 100 parts of ash to be

40·2 per cent., and the maximum 44·6 per cent; the analyses of bones of stijfziekte animals (complicated form) varies from 39·93 per cent. to 41·55 per cent; the difference between the two minimums is 0·27 per cent. in favour of healthy bones, and the difference of the two maximums is 3·05 per cent., also in favour of the healthy bones. The average in stijfziekte bones would be 40·99 per cent., and in healthy bones 42·1 per cent., and the difference would be 1·11 per cent. There is, accordingly, a slight difference in favour of the healthy bones, but, taking the two minimum and averages into consideration, the discrepancies only amount to just over 1 per cent.

Concerning the percentage of lime present in the ash of the bones the comparison of the analyses of the bones of three healthy cattle shows a m ximum of 55·21 per cent., and a minimum of 54·17 per cent., or a variation of 1·04 per cent. In the diseased bones the maximum amounted to 57·47 per cent. and the minimum to 56·35 per cent., or a variation of 1·12 per cent.

Of further interest to us will be the ratio of phosphoric oxide to lime. This ratio in healthy bones in three animals reads as follows :—1 : 1·330, 1 : 1·183, and 1 : 134, and in three diseased bones 1 : 1·453, 1 : 1·356, and 1 : 1·385. Accordingly, there is a slight discrepancy between the two, there being less phosphates or more lime in the diseased bones as compared to the healthy bones.

(To be concluded.)

South African Fertile-Worker Bees and Parthenogenesis.

By D. S. van Warmelo.

In the May, 1912, issue of the *Agricultural Journal* of the Union of South Africa an article appears, under the heading "South African Fertile-Worker Bees," by G. W. Onions, disproving the generally accepted Law of Parthenogenesis in the honey-bee as signifying the production of drones and drones only. The writer apparently knows what he is about, and his observations must be regarded as correct: the article gives evidence of an intimate knowledge of modern bee culture and bee literature, as well as much experience gained through a genuine desire to verify by personal observation all theories regarding bee life. The contention is that the South African fertile-worker bee produces, as a rule, worker bees, and that drones are the exception. This is so contrary to all scientific knowledge regarding the honey-bee of other countries that, at first sight, on reading the article in question, one feels constrained to discount its statements on the following grounds:—

1. In almost every respect the South African honey-bee differs very little from the ordinary bees of other countries, and it is therefore highly improbable that there should be such a great deviation as to confound all science relative to the Law of Parthenogenesis in the honey-bee.

2. Mr. Onions appears to test whether his African queens are virgins or not from the progeny they produce, and, therefore, accepts the Law of Parthenogenesis with regard to the African *queen*. Considering the anatomical internal structure of the queen, it would seem contrary to all laws of nature that the African *worker bee* should produce her progeny in a wholly different manner from the queen, which is essentially a worker bee with fully developed reproductive organs. With the queen bee it is an established fact that all worker-producing eggs receive the male sperm in their passage down along the oviduct by contact with a gland attached to the spermatheca. Most scientists seem to agree that the queen has control of this gland and that fertilization is, therefore, a voluntary act on the part of the queen, i.e. she produces either drones or workers at will. Without impregnation it must then be impossible for a worker bee, an undeveloped female, to accomplish what even a fully developed female, a queen, is unable to do.

The above arguments are of a mere speculative nature and their principal object is to serve as a warning against the acceptance of a theory, encroaching upon the fundamental law of nature regarding the honey-bee, that there can be no female propagation without fertilization. There are in South Africa two distinct races of bees, the yellow and the black bee. From Mr Onions' article I gather

that he used the yellow bee in his experiments. I have myself reared many Italian queens in Pretoria, and although I have met with some of the same difficulties with which Mr. Onions appears to have been confronted, I have never experienced anything similar to what he states about African fertile-worker bees. My African bees were all of the yellow strain. It may have been due to my locality, or to want of observation, or otherwise to my strain of bees, but with me fertile workers have never been so persistent as has been the case with Mr. Onions; and in a fertile-worker colony or nucleus I have never seen anything but *drone* cappings. At the same time, however, I must admit that I have never given fertile workers full play, but have always strenuously endeavoured to get rid of these pests of the African apiary. Incidentally I should like to recommend my own method in this connection as being the safest I have yet read or heard of. Mr. Onions complains, like so many others, of the difficulty of introducing queens to a fertile-worker colony; let him try the following method and I guarantee he will seldom, if ever, lose a queen even when introducing her into an African fertile-worker colony. Make a swarm of the colony by shaking all the bees out in front of an empty skep on the old stand. Leave them clustered in the skep for a few hours, again throw them out in front of the skep, and let the queen to be introduced run along with them into a hive fixed with foundation comb. This method can seldom fail. The chief point is this that the bees must feel themselves a swarm, in which condition they will not refuse admission to a strange queen, swarms—especially after-swarms—often being accompanied by several queens. As soon as this swarm-made colony has established itself on its new comb, the best of the queens and pseudo-queens will be put on the throne, in this case undoubtedly the fully developed queen. In connection with this I may also state that the reason why the moving of the fertile-worker colony to a new stand and introducing the queen on the old stand often proves a failure is because some of the fertile workers are apt to find their way back to the old stand where they are still acknowledged by the returning bees as the reigning queens and as such accepted.

But, to return to the subject in hand. Speculative arguments against Mr. Onions' theory are not conclusive evidence. We require more substantial facts for the refutation of his theory; and in the absence of more widely conducted experiments we can do nothing but simply point out the incorrect conclusions—if there be such—drawn by the writer himself in his own article. Mr. Onions, being a practical beekeeper and one who appears to be well acquainted with beekeeping and bees, we are bound to accept his observations as being correct. But I shall endeavour to prove, in a few words, that the conclusions he forms are not convincing proof to us that his theory is correct. I contend that, if it be true that the African worker bee is capable of producing worker bees, she must have been impregnated by a drone, perhaps a diminutive drone, in which case the Law of Parthenogenesis in African bees still holds good, for then she is no longer a fertile-worker bee but a partly developed queen.

This is a fact Mr. Onions seems to have overlooked, for we find no reference made to this point in his article, with the result that his deductions appear to be incorrect, for the following reasons:—

1. On page 721 an "instance is given of the assiduity" of the African fertile-worker bee when one of these pests had found its way

into a golden Italian hive. According to the writer, on the third day after the removal of the Italian queen this fertile worker was observed to be treated by the bees as a queen. Now, this points to the probability of the worker bee having, as a pseudo queen, flown out of her own hive *in order to meet the drone* and having landed in the wrong hive, it being very unlikely that a fertile-worker bee should ever leave a hive for any other purpose.

2. On page 728 Mr. Onions states that he has, by constant practice, acquired ease in detecting fertile workers by other signs besides the act of ovipositing. It is a fact well known to beekeepers that laying workers are distinguishable from ordinary worker bees. Now, it would appear that some of them may have developed the latent qualities of the queen to such an extent that they are, in the true sense of the word, simply diminutive queens. This change may have been brought about by the worker bee having hatched from a rather large cell, or by her having, somehow or other, received royal jelly in her first stages of development, or otherwise by having been chosen by the bees as an intended queen in a rather advanced stage of her larval existence.

3. The deduction on page 722 of Mr. Onions' article that "African workers' eggs, then, not only do not invariably hatch drones but, broadly speaking, it may be said of them that they do not produce drones," is no logical conclusion with regard to the theory that the Law of Parthenogenesis does not apply to the African worker bee, but rather strengthens my argument that a fertile worker which produces worker bees has been impregnated by a drone. For Mr. Onions has conducted his experiments in nuclei, whereas every beekeeper knows that a young queen generally does not produce drones in a very weak nucleus, their presence not being needed where there is no desire of swarming or superseding.

4. Our speculative arguments we bring to bear on our more convincing proofs. It follows from the last-mentioned point, taken in connection with point 3, that a fertile worker being, as I contend, an undeveloped queen, cannot continue laying worker-producing eggs for a considerable length of time and is not long lived, and is consequently bound to produce drones as soon as the spermatozoa in her spermatheca lose their vital strength. Well, this Mr. Onions states to be actually the case on page 724, where he says "The falling off of laying-worker fertility is accompanied by a few diminutive males."

5. Again it follows from my last point that a laying-worker colony will naturally very often continue attempts at superseding, because the bees feel that the strength of the impregnated worker bee or worker bees is failing. This appears to have repeatedly been the case in Mr. Onions' experiments, even though these bees continued killing their hatching queens through the presence, presumably, of the reigning laying workers whether these were impregnated or not. The queen cells that are built so persistently in such cases I would call supersedure cells.

These are my principal arguments against Mr. Onions' theory, and in the light of his discovery it is apparent that, probably, there is no such thing as the purloining of eggs by eggless and larvaless colonies, and that, in the bees of other countries, occasionally—perhaps frequently—fertile-worker bees also become impregnated and are therefore enabled to raise queens for the propagation of the species.

This may then be a form of atavism, becoming less frequent in the higher order of insect life.

The article in question by Mr. Onions will probably lead to further experiments for the elucidation of the subject, also in other countries where much in connection with so-called fertile workers still remains a mystery.

Harmony, Pretoria, May, 1912.

Wild Honey;

WITH NOTES ON THE MOKA BEE.

By Adv. Eugène N. Marais, S.J.P., Waterberg.

While the majority of the inhabitants of the Northern Transvaal are groaning under the unbroken drought, while mealie lands everywhere are desolate and the parched and cracked earth seems incapable of ever being wet again, the hunters of wild honey rejoice. Strange as it may seem and contrary to the experience of bee-keepers generally, it is a fact beyond doubt that wild hives in this district are never so rich in honey as during a severe drought. Why this should be I cannot understand. The veld is almost destitute of flowers. The masses of white and yellow orchids, which cover the sandbults during a wet season, are absent. The boekenhout and syringa have steadfastly refused to flower; not even the hardy hypoxis has put forth a single yellow bud. The only compensation seems to be afforded by the zoetdoorn (one of the acacias). These trees started flowering early in the season, but long before the pollen was sufficiently developed to effect fertilization the blossoms had been parched by the sun and had fallen to the ground. Since then the trees have burst into flower after each little shower which we have had—always ineffectually. In this neighbourhood they have now been in flower four times up to the date of writing. During these ephemeral blossomings they afforded the spectator a good indication of the vast numbers of bees there are in Waterberg. As far as the eye could reach the bushveld was gorgeous with these bright yellow powder puffs, and yet each individual tree hummed with the song of bees from sunrise to sunset. And there need be great numbers in good sooth to preserve the species from extinction. The sons of the old big-game hunters —who settled this district originally—with the veld in their blood and bones, have turned into very clever honey-hunters, and, with the assistance of the honey-bird (always very eagerly tendered), the unfortunate bees have but a poor chance. The Kaffirs, too, destroy enormous quantities of hives each year. The hunters, of course, depend absolutely on the guidance of the honey-bird. At this season one hears everywhere in the veld the long melodious call: "Sethlo-ma Ma Marakane! Impe di nodzi."* If it were not for the wonderful—I cannot call it instinct, it is something higher and different—ways of this chattering little bird, the game of hunting wild honey would hardly be worth the candle. In fact it is not spoken of as honey-hunting; they say here: "Let us search for birds to-day." To describe all the wonderful ways of the honey-bird would, however, need a longer article than the present one and would be too much of a divergence.

* "Sethlo, Mother of the Wilderness, give us honey!"

There are in Waterberg two kinds of honey made by the common bee. One is the golden-yellow kind known all the world over, while the other is an absolutely white honey—white as driven snow, with a flavour and fragrance peculiarly its own. When expressed from the comb it almost immediately solidifies to the consistency of vaseline. In this state no one would imagine it to be anything but pure lard. It is known amongst the boers as "Sheeptail fat honey," and is found on portions of the Springbuck Flats and on the two middle velds. The pure white is said to be due to the fact that the bees extract the honey from certain grasses only, and never visit flowers for this purpose, although boekenhout, syringa, and acacia are as plentiful in these districts as with us. I have had no opportunity of any extensive personal observation, so that I cannot vouch for this fact. I did notice, however, during several visits in the company of honey-hunters that the white-honey bees swarmed over certain kinds of grass, then in flower. The hives are generally in hollow trees; occasionally in ant-bear holes or hollow ant hills, and the honey is much sought after, both on account of its beautiful appearance and exquisite flavour as on account of certain valuable therapeutic properties it is supposed to possess. It will give some idea of the quantity of white honey there is in the Magalakwin middle veld when I state that two honey-hunters whom I accompanied some seasons since secured eighty-three bottles of expressed honey in two and a half days. It must be added, however, that the birds were on this occasion especially active and propitious.

Except in the case of krans-hives the extraction of the honey is generally followed by complete destruction or dispersal of the swarm. In the case of tree-hives this is, generally speaking, unavoidable, and although—to their credit be it said—the bee-hunters do all in their power to preserve a hive after robbing it of its honey, this is very seldom possible; and even where the circumstances are favourable the bees nearly always desert the hive after the drastic smoking to which they are subjected. The krans hives are seldom permanently deserted after a marauding expedition by whites or blacks. Many of them are situated in such inaccessible places that a daring climber only can reach them, and then only with the assistance of riem-ropes and aerial ladders that make one dizzy to contemplate. In addition to this the krans-bees are generally the most vicious, while those in earths are generally the least pugnacious, and although the former are invariably far richer in honey they are seldom disturbed even where there is every facility for a thorough smoking.

The bee-hunters wear no protective clothing of any kind; indeed where any mountaineering has to be done, the clothing is always of the scantiest. But the majority of them have been so thoroughly inoculated with formic acid as to appear—like the ratel—entirely immune to its effects. I have seen honey-hunters emerge from the fray with the enemies' darts thick upon them like quills upon the fretful porcupine. In such cases the worst symptoms experienced are slight fever and nausea, which, however, pass over quickly.

Next to *homo sapiens* the ratel is the most efficient, persistent, and destructive of hive-robbers, and loud and deep are the execrations of the hunter who has been led a hot and laborious march through kloof and

poort by a honey-bird to find the hive ransacked and rifled of every vestige of honey by the ratel. Hence it is that next to the makopa the ratel is the best hated of animals that haunt the bush veld. If, however, the bees could express any opinion I think they would prefer the nocturnal depredations of the ratel to the marauding of man with so able a coadjutor as the honey-bird. Rock and tree hives are at least safe as far as the former is concerned, but no stronghold is secure against the ingenuity of the two latter.

The honey is collected and kept in bags of tanned duiker or steenbok skin. The skin is taken off without a belly incision and the *knap-sak* when completed is in all points similar to the wine-skins of Spain and Portugal. After liming and tanning, the bags are turned inside out and washed for several days with strong home-made alkaline soap. Straps are then attached to the four legs and it is thus transformed into a very comfortable and easily-carried ruck-sack. These bags improve with age. When once thoroughly saturated they become jet black and ever after strongly diffuse the sweet fragrance of honey. To taste honey in perfection the good housewife must open for one's entertainment some special bag of snow-white "sheeptail fat" honey that has been kept carefully shut and stored for several years. It is an experience that will long dwell in the memory of every lover of good things to eat.

The general favourite among all consumers and hunters of wild honey is the product of the little stingless Moka bees. Among town-dwellers and bee-keepers so little is known of the Moka that the majority are apt to consider all accounts of a *true stingless honey-bee* as a fairy tale. I am sending by parcel post specimens of the bees (drones, workers, and a queen) together with a vial of their honey, also the comb, propolis, and queen-food. I am sure that all interested in bees would appreciate a scientific account of them by the Government Entomologist to accompany these notes. Moka bees are of two varieties. One kind is extremely small—very little bigger than the gnats of summer, but they are none the less true honey-bees. The other variety, to which the forwarded specimens belong are considerably larger. In their ways generally they resemble at all points their larger cousins the common honey-bee, with the one exception that they possess no sting of any description and are therefore quite harmless. However, the protection of their hives depends—as will appear later—on a circumstance quite as effective as are the weapons of their pugnacious cousins.

This larger Moka builds only in the ground, and they are not dependent on deserted earths like the common honey-bee. They make their own earths, and a stupendous labour it must be, considering the size of the workers. For this purpose they select the hardest soil to be found—those level barren patches which the Afrikanders call *brak*. In this almost impenetrable earth they commence operations by digging a vertical shaft of about the diameter of a lead pencil, varying in depth from two to five feet. At the bottom of this shaft a hollow is excavated which is apparently enlarged as the size and operations of the swarm increase. In this hollow the honey is stored. In the plan of the hive and the method of breeding the Moka bees differ somewhat from the common bee. The honey is stored quite

apart from the comb in little wax bags about the size of a large thimble. These are cemented together with wax until a cluster has been formed about the size of an orange when they are again covered with an outer skin of wax. The shape of the entire bag is that of a Roman wine-amphora without the handles. As soon as one such bag has been finished, another is commenced, until there are a series of them with the necks all converging towards the shaft and the bottoms widening out into the hollows. Between these bags the comb is made similar to that of the common bee, with this difference that the cells are much smaller and contain no honey. At the exit of the shaft a tiny chimney of propolis is made to exclude dust, pebbles, and storm water from the hive. The combs are packed between the honey bags one on top of the other, separated by smaller pillars of wax at the corners. Here in the centre of her domain the queen dwells.

It will be seen, therefore, that, stingless as they are, the Moka bees are well protected against all honey-thieves and especially against man and the ratel. The honey-bird never leads to one of their hives and the ratel after a few futile scratches generally abandons the attempt to reach the honey through that rock-like earth. It is these scratchings of the ratel which frequently disclose the presence of a hive to the human honey-hunter, by whom no pains are spared to secure this the most popular and expensive wild honey found.

In flavour Moka differs widely from common honey and I do not think there is anybody who will not give it the preference. The ordinary taste and fragrance of honey are there, but it has in addition a slight and very pleasant acid flavour which completely does away with the utter and cloying sweetness of common honeys. It can be partaken of in considerable quantities without the least danger of any of the evil consequences that often follow the unwise use of common honey. I have known one case where there was so pronounced a constitutional antipathy to honey that its effects invariably resembled those of a virulent poison. One teaspoonful would occasion a general rash all over the body, dilation of the pupils in co-ordination of movements, and extreme vertigo. In this case Moka was eaten in considerable quantities without any bad after effects. Like the white honey it also has the reputation of possessing many therapeutic properties, especially in certain female ailments, and is on that account greatly valued.

When once the hive of the larger Moka has been located the *modus operandi* is simple enough, and the only real trouble is the hand digging necessary. The Moka hunter visits some favoured *brak* towards sunset and lying flat on the ground faces the west. When the bees are at work they form a whirling cloud above their tiny chimney, resembling in miniature, the funnel-shaped tornado cloud of America. Against the illumined west the honey-hunter detects this little cloud and then the fate of the hive is sealed. A long twig or tambukie grass is first of all thrust down the shaft into the honey, so that the direction can be maintained after the shaft has been lost in the loosened soil. The experienced honey-hunter can tell at a glance whether the hive is likely to be " fat " or " lean " and whether deep or shallow.

The quantity of honey found in these hives varies just as in the hives

of the common bee. That from which the present specimens were obtained yielded four pints of pure honey, and I have known hives from which two gallons of honey were obtained. These are rare exceptions, however. Generally speaking, the digger is satisfied if he obtains two or three bottlefuls. Very frequently a hive will yield only a few spoonfuls—but in this respect the Moka differs in no way from the hive of the common bee.

The question at once suggests itself whether it would be possible to make any commercial or otherwise profitable use of the Moka. This is a matter for future scientific investigation. My own experience is that the Moka is very easily domesticated. If a little care be observed in the digging and water constantly sprinkled on the soil to keep down the dust, the hive can be removed in its entirety with the swarm and carefully placed in a previously prepared box, with a shaft and chimney ready made. The industrious little inhabitants immediately sat about remedying any breakages in their city. The box can then be placed under a verandah, or even inside a room near a window. Nothing will induce them under such circumstances to desert their hive and they continue their incesssant labours without showing any objection to the presence of man. A window of glass can be so placed in the box as to enable one occasionally to view their labours inside, without exposing the whole hive to the light. This partial lighting now and then does not seem to disturb them greatly.

The smaller variety of Moka is known among Afrikanders as *os-bije* (ox-bees)—why I have not been able to discover. Those building in hollow trees are more easily discovered than the rock-builders. On a hot summer's day these tiny bees will settle in swarms on one's hand and face evidently in search of moisture, and this is a sure indication of the vicinity of a hive. It is known that they build only in trees of the hardest and toughest wood, and even among these they have certain pronounced favourites. It is only necessary in such a case to examine carefully the favoured trees in one's neighbourhood and the hive is soon found. The most pure honey I have seen to come from a hive of the smaller Moka was about two tumblerfuls. It resembles that of the larger Moka in flavour, and in all other respects. The bees are as easily domesticated as the larger Moka and are more easily removed. All that is necessary is to saw out the hollow portion of the stump—after securing the swarm by plugging the exit overnight—and removing it to some selected spot in a room or under a verandah. These little bees appear to appreciate the presence of man. They have at all events no fear of him and will speedily learn to settle in swarms on an extended palm in search of sugar or syrup. And to watch their unending labour among the flowers is a real pleasure. So greedily and clumsily do they tumble from one calyx into another that they are speedily covered with pollen, and the stream returning to the hive resembles tiny balls of yellow down afloat in a current of air.

[NOTE.—The stingless social bees are tropical in their distribution and belong to the genus *Trigona*, several species of which have been reported from Africa. The species in question (the larger Moka bee) is closely allied to, if not identical with, *Trigona clypeata*, Friese, which has

been described from a number of workers found on a narcissus species (fam. *Amaryllidaceae,* gen. *Buphane*) by L. Schultz, November, 1904, at Kooa (Kalahari). The locality has been thus far the most southern of the known distribution of the genus *Trigona.* It is situated at the latitude of 25° S. It seems that thus far only the workers have been collected: the queen is unknown.

REF.—H. Friese.—*Die Bienen Afrikas nach dem Stande unserer heutigen Kenntnisse.* Jena, 1909.

C. B. HARDENBERG,
Transvaal Entomologist.]

White Grubs in Sugar-Cane Fields.

(A memorandum by CLAUDE FULLER, Government Entomologist, Natal, to the Natal Sugar Association, May, 1912.)

THE literature bearing upon the cultivation of sugar-cane is pregnant with references to damage done by the grubs of Cockchafer beetles, and yet this form of cane injury is practically unknown in Natal.

Despite the fact that there does exist in the Province a wide variety of Chafer beetles, several of which occur in swarms—especially two which have adopted the introduced wattle as a host-plant, viz., the Larger Wattle Chafer, *Hypopholis sommeri,* and the Lesser Wattle Chafer, *Monochelus calcaratus*, complaints of the depredations of their young or grub stage are very few and far between. Indeed, I have only had three cases brought to my notice during my thirteen years sojourn in Natal, and these have not been serious in their extent.

In one case the grubs were destroying numerous garden plants by eating off the roots, and in the other a grass lawn was seriously involved, the grubs practically undercutting the whole of the turf. In both these instances the infested spots were close up against wattle plantations, and it was not surprising, therefore, that when reared to maturity it was found that the culprit was the Larger Wattle Chafer. This insect originally passed its earlier stages in the veld and its adult or beetle form on native acacia trees. Nowadays it has become abundant because wattle plantations not only afford a wide feeding ground for the beetles but also because the roots of the wattle provide suitable food for the grub, thus giving the insects every opportunity to increase and multiply without incurring any of the risks or accidents incidental to a search upon the part of the mother insect for a place in which to deposit her full complement of eggs.

In view of the fact that grass roots are, as a whole, the natural food of our native species, the presence of wattles near to cane plantations at once suggests an attack of white grubs upon cane, and I have no hesitation in saying that if not to-day, at least in the future, such is likely to be the natural course of events where wattles are so grown.

Whilst every agriculturist may not be familiar with Cockchafer beetles, all are quite well acquainted with their larvae, or as I term them, "White Grubs." Despite the great variation in size and colour and even habits of the adult beetles, "White Grubs" are all singularly alike. I have only to say that the most conspicuous of our local White Grubs is that which is found in manure piles or heaps or rotting bagasse, for every one to call to mind their familiar form. The helpless, white, bent bodies, ending in a swollen bluish

hump, the hard, brown heads, and six long legs pawing the air helplessly as the creatures lie on their sides when turned out of the soil, are such well-known features that a detailed description is unnecessary.

The life-cycle of these insects is briefly that the female beetles place their eggs a little way beneath the soil and these soon hatch. The grubs feed upon the roots of the plants about, some sorts for a year, others for two, and others again for longer periods. When mature they construct little cells in the earth, changing there into pupæ, or chrysalides, and later into beetles; when the life-cycle starts again. The grubs generally go deeper into the soil to pupate, so that whilst when feeding they may be within a few inches of the surface they will subsequently be sixteen to eighteen inches down.

With these premises I have now to draw the attention of planters to a case of "White Grub" attack upon sugar-cane which was recently brought to my notice by Mr. Colin Campbell, at Mount Edgecombe.

So far as it has been able to ascertain the position, this attack is in the form of two patches which in the aggregate are probably not more than an acre in extent. The damage done was quite conspicuous, and if equalled over a large area would be ruinous. Measures were recommended, and a gang was put to work to hoe over the land and collect the grubs, then about four to six inches below the soil level. A large number were obtained, which have been estimated at 60,000: a pretty considerable amount considering the comparatively small area infested. I need not hesitate, therefore, in saying almost dogmatically, that the insect under discussion possesses vast potentialities for mischief, and that cane-growers should be alert for its detection in the fields and adopt heroic measures for its eradication. In speaking thus I do not for one moment wish to appear as an alarmist. There is a possibility always that this form of insect attack has long been present in our cane-fields and its injury, confined to reasonably small areas, attributed to soil poverty or other unknown causes. At the same time this may not be so, and, consequently, I can candidly say that the risk is not worth taking. That is, the risk of the pest establishing itself in any given field and then, through neglect of one or two slight infestations, being allowed to spread and establish itself equally throughout a whole plantation.

When the first examination of the infested patches was made I was not able even to surmise what specific insect the damage was due to, but a subsequent investigation of the result of the treatment resulted in the finding of some adult beetles ensconced at a depth of sixteen to eighteen inches in the soil, where it is presumed they would remain until the bulk of the brood came to a like stage and issue from the soil in the spring. I say "would" advisedly, because no effort has been spared to rid the soil of as many of the insects as possible by collecting them.

From an examination of the beetles I can only say that it strikingly resembles that which is drawing so much attention upon itself in Mauritius at present. I am not prepared to go so far as to say that it is exactly the same species, but for all practical matters it can be regarded as the same.

Now, the beetle which is doing so much damage on that island has recently been described as *Phytalus smithi*, and it also exists in the Barbadoes, where it is known as the Sugar-cane "Brown

Hardback." According to a recent writer in the *Agricultural News*, the official organ of the Imperial Department of Agriculture for the West Indies, the insect is not there regarded as a serious pest. This writer says:—"It is naturally of considerable interest that, while the brown hardback in Barbadoes is not recognized as being of any importance as a pest in that island, in another part of the world the same species should develop to such enormous numbers and should become a pest of such great economic importance."

In Mauritius, however, it has quite a different phase. In a report presented last year by the Government Entomologist of Mauritius (Mons. D. d'Emmerez de Charmoy) it is stated that over three hundred acres of cane were involved at Pamplemousses, and "The extent of the damage done by the species will be understood when the number of larvae per unit of area is calculated. We found in four months old virgin canes an average of ten grubs per hole, e.g., 30,000 per arpent, reckoning 3000 holes per arpent. Between the rows, and therefore in hard soil free from straw, the number was 4300 on a length of 400 feet and a width of 4 feet, and 2640 for the same space in furrowed ground. This brings the total per acre to 36,940, say 37,000."

More recent news concerning the insect appears in *Agricultural News*, from which I extract the following observations:—

"Since the time that this beetle was first reported, it has attracted attention from all parts of the sugar-growing world, on account of the very serious nature of the damage done by it, and also because of the fact that it is seemingly a new form, certainly new to Mauritius; and, up to the present time, apparently not identified in any published account of the insect.

"The enormous numbers in which these insects have occurred are shown in two letters which have been received by the Imperial Commissioner of Agriculture from a correspondent in Mauritius. In one of these, dated 15th December, 1911, it was stated that the adult beetles were being captured in large numbers, over 390,000 having been taken in a single night; a postscript added on the 19th of the month gives the record of 1,372,000 beetles taken in one night!

"The method adopted for the capture of the beetles is ingenious. This work is done by East Indians—men, women, and children—who stick small branches of trees into the ground in fields where the insects are known to abound. The branches, having the appearance of small shrubs, are placed irregularly, at no fixed distance apart; this may vary from 15 to 50 feet. At dusk the insects come out of the ground and settle on the branches, from which they are collected by the Indians, who are provided with small hand lamps. The insects are taken to the officer in charge of the work, and are paid for at a given price per thousand.

"In another letter from the same correspondent, under date of 28th December, 1911, the Imperial Commissioner was informed that the record capture of the season amounted to nearly 3,000,000 of the beetles in one night, while the total number for the months of November and December exceeded 25,000,000. During the latter part of December, however, there was a decided falling off in the number of insects taken, the last figures received being 275,000 for one night near the end of the month.

"It would appear from the information received that the collecting of the adults, especially towards the end of the year, was the

control method on which the greatest dependence was placed; although it is possible that experiments with other methods may have been under progress and will be reported upon later.

"A question of very great interest in connection with the outbreak of the beetle in Mauritius is that of its identity, relationship, and original home. There seems to be no doubt that it is a recently introduced form in Mauritius, and the fact that it occurs in the vicinity of the gardens of Pamplemousses gives rise to the surmise that it may have been introduced among plants imported for the gardens."

It will be seen from the above that the insect is regarded as a more or less recent introduction into the Island of Mauritius, and the question arises whether or not it has also been similarly introduced into Natal.

Even should our species, when examined by a coleopterist, prove to be identical with *Phytalus smithi*, as I take it to be, it will still have to be shown that it is an introduced species. If so, it must be conceded that it has been introduced many years ago, and not recently, otherwise it would hardly have made its first effective appearance when it did.

Assuming this to be the case, there are two possibilities, one that the insect is only now sufficiently established or acclimatized to become noxious, the other that it is under some form of natural control.

Presuming it to be a native species, this may be the first evidence we have of its adoption of the sugar-cane as a food-plant, or that it is under natural control and has always been present, but to such a minor extent as to have been overlooked by cane growers. There is one other possibility, and it is that the adult beetles feed naturally on acacias, and the introduction of wattle culture into our cane-belt has provided an opportunity for the increase of the species and the infestation of cane-fields, not previously existing to a sufficiently great extent.

Be it as it may, however, it is not worth considering any of these points from the practical aspect of the matter. We know the pest is present; we know that it can be destructive, and it is far better to treat it with suspicion, watch for it, and eradicate it as far as possible from the fields when found, than adopt a *laisser faire* policy and let things slide until, perchance, a large area is infested.

There is unfortunately no easy mode of dealing with White Grub attack, and no more practical recommendation can be made in the present state of affairs short of digging over the land and collecting the grubs. For this reason alone it is necessary to make short work of the small patches found, for all will agree that what is a practical proposition over an acre is not so in a matter of one hundred acres.

The Paragrèle or Hail-Preventer.

By Johannes J. C. L.

This is an invention of two French landowners, General de Négrier and Count de Beauchamp. The following municipalities have erected or rather "fixed" the apparatus with good results, i.e. no serious damage has been done to crops: St. Julien l'Ars, Chauvigny Paizay-le-Sec, and St. Sauvin. These four stations, as we may call them, are about six miles apart, and form a very effectual electrical barrier (*barrage électrique*), which has now been working three years. After each storm the report by the Mayor or other authority has been "no damage." No hail is found within the protected area, and hailstones which may have been formed at some distance beyond the barrier melt at once when driven to the protected area by the wind, and do not the slightest damage. The inventors have given the name of "Electrical Niagara" to this apparatus, and as Niagara paragrèle it has become widely known on the European Continent. A permanent commission has been established at Paris for promoting and examining this and similar undertakings. Professor Violle of the Paris Scientific Académie has published a favourable report on the working of the system in the valley of the Vienne, i.e. on the four stations aforementioned.

In 1911 Senator de Pontbrian reported to the Agricultural Committee of the French Senate, strongly recommending the erection of many of these hail-preventers, to obviate damage to vines, etc.

It is almost certain that the Eiffel Tower, the Sacré-Cœur Tower at Montmartre, the Panthéon, and other high spots in Paris will be used as stations to protect the whole of Paris effectually from hailstorms (and thunderstorms).

Now as to the construction of the apparatus. It is very much like a lightning conductor, and consists of (1) a *terminal* to top the clouds of electricity (the inventors call this in particular, the "Niagara"). It is made of pure copper, but any very good conductor would do; it is usually made in an ornamental form, such as an aloe, and has a removable "collar," to get round the weather-cock or the cross, etc., of a church tower, factory chimney, or other high projecting object. As a rule, it is at least 33 feet or 10 metres above the top of the highest trees in the near neighbourhood. (2) The *conductor* which passes the electric fluid off to the earth: this is made of thick copper plates, and should be enclosed in a lead casing to prevent oxidation, and is generally properly protected from the weather. Sharp curves and sudden turns, bends, etc., must be avoided as much as possible. To the lower end of this conductor is fixed the (3) *diffuser*. This part is also of copper, and is placed in a pond or well, running stream, or, best of all, in an underground watercourse.

The total cost of the erection of several of these hail-preventers, to protect a large district (in France, of course), is, as I am informed, no more than 1 franc per hectare, or four to five pence per acre. Suppose it would cost here 200 per cent. more, i.e. twelve to fifteen pence per acre, it would still be worth while—aye, *urgently necessary to erect hundreds of these hail-preventers in South Africa.* Who will be the first to introduce them here?

Dynamite on the Farm.

SINCE the appearance of the last issue, containing a contribution by Mr. Kenneth B. Quinan, General Manager of the Cape Explosives Works, Somerset West, Cape Province, on the use of dynamite in agriculture, we have had opportunities of witnessing several very interesting demonstrations bearing on the subject. The first we saw was carried out by Mr. Wingate-Wright, of Johannesburg, on Mr. Russel's farm at Birchleigh, a wayside station close to Zuurfontein, on the Pretoria–Johannesburg railway. The conditions here were sufficiently typical of the high veld to give a very fair idea of the possible value of this particular method to farmers in similar circumstances. The soil is a deep loam, and when the experiments were carried out was in a suitable condition to show sound results. That is to say, the spot selected was dry, and the sub-soil seemed well compacted. The method adopted by Mr. Wright was to bore holes a little more than half an inch in diameter to depths varying from about 3 feet 6 inches to about 5 feet 6 inches. In each hole he lowered one cartridge, weighing about 2 ounces of ordinary gelignite, the blasting compound used for rock-breaking in the mines. Prior to lowering, the usual detonator was, of course, attached to the cartridge in the ordinary way, and the necessary length of fuse to allow of same being lighted to explode the charge. The hole was then tamped with damp earth, and the fuse lighted. The effect of the explosion in the deeper holes was not much marked on the surface, and the ground being so hard, it was difficult to dig down to the lower depths to see what had happened below. But the effects of the charges in the shallower holes, say from 3 feet 6 inches to 4 feet, was more satisfactory, as not only could the result be noticed on the surface, but the action of the explosive was such that the ground was easily removed with a spade and cracks and fissures could be traced in some instances as far as 6 to 7 feet from the centre of the explosion. On removing the top soil, the effect on the sub-soil was most marked and highly satisfactory, fully demonstrating the utility of explosives for soils of this nature. It is more than doubtful if it would have been possible to get a plough into this particular piece of ground in the condition it then presented, so that here at least was the beginnings of the solution of one of this country's serious cultural problems.

The work done by Mr. Wright must be taken as of an entirely experimental character, for though an expert in the handling of explosives for other purposes, he is, we believe, more or less of an amateur in conducting agricultural operations by its means. In addition to this, it has to be remembered that he was further handicapped, in that he had to fix up all the implements for his purpose. His method of sinking the holes, for instance, was to use an auger, which he had to have specially made. Though this was effective, the results of later demonstrations we had the

pleasure of seeing show that the work of sinking the holes for the charges can be done better and with more expedition by other means. The explosive he applied is also quite different to that which has been brought into use for this purpose. Therefore, considering all the circumstances, Mr. Wright's experiments may be taken as even more successful than they appeared, and it is hoped that may lead to encouraging others to follow them up on a field scale. We understand that Mr. Russell intends giving the system a fair trial at no distant date. That he and others similarly situated should be encouraged to carry on this work is amply shown by the results which have been obtained not only in America, where these practices are quite common, but in the districts of the Western Province of the Cape, where Mr. Quinan has been carrying out some exceedingly valuable demonstration work, as related in our last issue.

The result of a personal attendance at some of Mr. Quinan's demonstrations, and considerable discussion with that gentleman and members of his staff, has impressed us deeply with the conviction that this method of sub-soiling should prove of incalculable value to many parts of South Africa. But to assure success, the work must be carefully and properly handled, and "rule of thumb" will have to be carefully avoided. In other words, everything must be adjusted to the local conditions of soil and climate and from the first, nothing but the correct implements and the correct explosive used. The fact has been noted that Mr. Wright used gelignite, a highly powerful compound. That gentleman, of course, used that article because it was easiest obtainable for his experiments. Now the make of explosive used for these purposes in America is what has come to be known as agricultural dynamite, a blasting compound which acts in a different manner to gelignite. As the latter is made specially for blasting rock, its explosive velocity is very high. Its action in soil is accordingly rather different to that of the specially compounded agricultural dynamite, which is specially made to use in soil instead of rock. In other words, the agricultural blasting compound explodes slower than the rock-blasting compound. Therefore any one who is desirous of going in for this system should see that the right explosive is obtained. It can be manufactured by any explosive factory, but so far as we are aware, the Cape factory is the only one turning it out in this country at present.

The necessity of paying careful attention to this detail was fully apparent at demonstrations we had the pleasure of witnessing at the Government Viticultural Station at Paarl and on Sir Thomas Smartt's farm at Stellenbosch. Though the ground at each of these places was not in such a favourable condition for blasting as was that at Birchleigh, the results from the point of view of the agriculturist were more satisfactory. The explosions in most cases (except in the holes where specially heavy charges were used to show what could be done, if so desired, for deep trenching purposes) were only just noticeable at the surface, the actual soil displacement being scarcely as great as that of an ordinary mole-hill. But when the soil was opened up, it was found to be fissured and shaken in all directions, and in those cases where holes were sunk to demonstrate its uses for tree or vine planting, there was a regular pot-hole below, sufficient to satisfy the most exacting. Again, when the holes

were left undisturbed, columns of smoke were noticed to gradually rise out of the ground through the cracks and fissures, demonstrating the extent of the underground shock. And all this occurred, though one could almost stand over the hole while the explosion occurred. Of course, no one did so. but that was the impression the operation left on all who were present. At the same time, the shock below ground was distinctly felt for some distance. This seems to be the cardinal difference between using gelignite, a high velocity explosive, and this specially prepared agricultural dynamite or low-velocity explosive. In this case the ground was very wet and elastic from recent rains, so it is only fair to assume that had the ground been dry, the results would have been even more satisfactory so far as the sub-soil disturbance was concerned, for explosives act with better effect in dry ground.

Another great difference between the methods shown at Birchleigh and those in use by Mr. Quinan, was in the actual implements employed. At Birchleigh an auger was used to make the holes, Mr. Quinan uses an ordinary drill driven into the ground by a heavy hammer. The drill is over an inch in diameter, and is made of the best hardened steel. The point is set rather short, but it will make its way into anything, short of the very hardest rock, in very quick time. The holes are therefore punched into the soil, and they are made very quickly and at very little cost. The only trouble is getting the drill out again, but that is overcome by a very ingeniously contrived little implement in the shape of a grip, on the fulcrum and lever principle. So that all the outfit needed is one of these specially made drills, a 10-lb. hammer, and the grip. The lever can be supplied on the farm by using a piece of strong hard wood, say an old disselboom, resting on a couple of blocks of similar material. The set complete, including hammers for driving the drill into the ground, and appliances for cutting the fuse and fixing the detonators on the cartridges, costs, we understand, something less than £3. And with this a couple of ordinary farm hands, even raw Kaffirs, can make the holes at a great pace, once the selected spots are marked out. After the holes are made, the rest is quite simple. The preparation of the dynamite cartridge is not difficult, consisting of fitting the detonator and fuse. A wooden tamping rod is all that is necessary for setting the charge in the hole, and an ordinary broom-handle serves this purpose. It is necessary to be careful in tamping the charge in the hole, otherwise some of the effect of the explosion may be lost, but all these details can be learned from a special booklet which Mr. Quinan is issuing shortly, and which we had the pleasure of looking over in advance proofs. So that any one wanting fuller particulars can obtain them on writing to the General Manager of the Cape Explosives Works, Somerset West, Cape Province.

The real considerations for the practical agriculturist are, however, not so much the details given above, as the further consideration of how the system there outlined is likely to affect him in his industrial operations. All that can be said at this stage is it looks very promising. The actual benefits can only be shown by trial and experiment. This much further can be said, however, that in certain well-recognized and well-known conditions in this country, the use of this method of sub-soiling can only

result in certain advantage. In heavy, stiff, compacted clays, it is bound to act beneficially provided the soils are deep. In those cases where continuous ploughing has left what is known as a "hard pan", it is impossible to conceive of a better or easier method of restoring soil fertility by breaking up the lower strata and thus rendering available the latent stores of plant food. For the establishment of orchards or vineyards, where heavy and expensive trenching work is now necessary, hand spading being the only means available, this system should prove both cheap and effective. In fact in a dozen different ways there should be both advantage and profit in its use. But there are conditions in which its use might, conceivably, be attended with results far from beneficial. And there are other conditions where no beneficial results might follow, though no actual harm would be done. It has always to be remembered that certain classes of soil may not be benefited by the disruption of the lower strata, while others again would be greatly improved. In short, this system needs to be most carefully experimented with except in those cases where the conditions point distinctly to the possibility of improvement. To give two probable cases in point. Some of the Karoo silts in the river valleys of the Cape Province set so hard that the crying need of sub soiling has been felt for years. In such a case this system should work well. There are others of these same silts so loose and friable that it is doubtful if any advantage would be gained, if positive harm did not follow. It must never be forgotten that it is possible to over-drain certain types of soils, just as it is possible to have others too closely impacted. And that is just the one point to be guarded against in this system, for in loose, light, well-drained soils with, say, a gravel or boulder drift bed, there is always the chance of this occurring.

If all that is claimed for this method of opening up soils proves to be correct, and on the face of things there seems little reason to cast doubt upon the statements put forward. there is a great future for the system in South Africa The majority of the practical men who have seen the demonstrations have been convinced that there is a great deal in it, and many have already started trials on a fairly large scale. It is to be hoped that others will follow suit, and not only carry out the work, but keep careful records and let the country know exactly what the results may be when the crops come in. There are many sets of conditions where much could be done, notably in some of the older established lucerne lands, that would bring comparative results in a fairly short time, and we hope to see a set of experiments set afoot as soon as possible with that object in view. Another set of experiments that should be promising would be the treatment of "brak" soils by this method. Given a sufficiency of water, and this method of sub-soiling, and it would be a very obstinate case of "brak" that would not be improved. This, of course, opens up the allied question of sour or acid soils. But that is too large an issue to be discussed lightly as it involves other important considerations. No possible harm could, however, accrue from a few carefully arranged experiments, for on their successful result great industrial and even social problems might hinge. Much of the best districts of this country, so far as rainfall is concerned, are more or less "sour," especially near the

coast, and if the opening up of the sub-soils offered any prospect of palliation, it might pay to bring more of these sections under cultivation, even though they had to be heavily limed to complete the cure. In any case, the use of this particular class of dynamite for agricultural purposes has, we feel, come to stay in South Africa, and it would be as well for all interested in increasing production and restoring soil fertility to watch with care the result of the experimental work now being carried on. The question of costs has been fully gone into, and we can state positively that in most parts of the Union this should not prove prohibitive, but information under this heading, and all other particulars may be obtained on writing to Mr. Quinan at the address given above.

Ostriches from the Soudan.

Mr. R. W. THORNTON'S STORY.

Considerable attention has been concentrated recently on the return of the expedition sent by the Union Government to the northern sections of the continent to secure, if possible, the ostriches supposed to be in existence there of the special type from which the best feather producers among our South African birds are stated to have descended.

The personnel of the expedition comprised Mr. R. W. Thornton, who acted as Government Agriculturist for late Cape Government, and more recently as Principal of the Middelburg (Cape) College of Agriculture, together with Messrs. J. M. P. Bowker and J. C. Smith. The leader of the expedition, Mr. Thornton, has had considerable experience with South African ostriches, and Messrs. Bowker and Smith are recognized as competent authorities on the same subject.

The expedition returned by the s.s. "Ethiope," and landed 140 birds at Capetown on the 26th ultimo, the consignment being then forwarded to the Grootfontein Agricultural College at Middelburg, Cape Province. So far the only particulars to hand are those contained in a statement submitted by Mr. Thornton to a meeting of Members of Parliament and others interested held in the Old Town House, Capetown, on the 28th, when Mr. P. J. du Toit, Under-Secretary for Agriculture, took the chair.

Mr. Thornton then stated (as reported in the *Cape Times*) that some time back there had been a considerable stir in regard to ostriches in this country, and, in connection with his expedition, it had been thought wise at the time that they should leave for Northern Africa as quietly as possible, as there was a possibility of outside competition. However, that had been found unnecessary since. His party left Capetown on 2nd August last year, and after a month's stay in England, during which they were fitted out, proceeded by boat to the West Coast, arriving there on 9th October. They then transhipped to a boat and travelled up the Niger River for six days, when they had to take to the train. Arriving at the capital town of Northern Nigeria, they interviewed the Governor, and obtained his sanction for the removal of as many ostriches from the territory as they could possibly secure. They then resumed the train journey to Kano, the railhead town.

Into the Desert.

From there the expedition started with ninety-four carriers in the direction of the French Soudan, walking for two days. While in British territory the first thing they did was to approach the Arab traders through the British Resident and ask to see all the feathers they possibly could that had come in from all over the Soudan. They found it was almost impossible to do anything without the traders, but

the difficulty was to gain their confidence. However, in this they were successful with the assistance of Mr. Fisher, the Director of Education, who, by the way, has only one white assistant. Through his knowledge of the country and of Arabic they got the Arabs to trust them, and collected specimens of feathers from as far as about two hundred miles east of Lake Chad; and he might mention that as the feather caravans came through Kano they inspected the feathers. Kano was the great central market for Northern Nigeria and a portion of the French Soudan.

The expedition left South Africa with the idea that the feather required was to be a dense and strong feather that came from the region of Lake Chad. However, it was soon proved that they would gain nothing from these birds. The strain that they required was located some two hundred miles away. As soon as they found where the ostriches were situated they cabled to the Government for funds to buy in the French Soudan, as that was the locality in which they were most plentiful. The greatest difficulty was in regard to the money. The coinage of the French Soudan is exclusively silver, and it did not take much to make a load. The difficulty was surmounted by the expedition handing the money over to the Government of Nigeria, who forwarded it to French territory and arranged for them to draw through the French Government.

FRENCH GOVERNMENT'S ACTION.

They set out and marched 140 miles to Zinder, in the French Soudan, and approached the French Commandant with regard to the removal of ostriches. He said he did not think it would be possible to remove them, but he would cable for instructions. In the meantime Mr. Thornton also cabled to the High Commissioner and expressed a messenger back to Kano requesting the Government of Nigeria to use its influence on their behalf. The reply was that the British Government had approached the French Government, who declined to override the decision of the Governor of the Soudan, who had stated that no birds should be removed.

"This," proceeded Mr. Thornton, "was the best possible thing that could have happened to us, because there is still, to-day, in the French Soudan, a great number of birds, but as they cannot be removed we have nothing to fear."

Continuing, he said that when he left South Africa the estimate of the birds in Northern Nigeria was 10,000, and it was estimated that in Kano alone there were some 500. The total number of birds they could find in Northern Nigeria was 459. In the two provinces north where he supposed they would get the right bird there were supposed to be a thousand birds, but they were found to be birds of a wrong type.

The mission to the French Soudan having proved unsuccessful and yet successful, Mr. Thornton and his companions trekked south again to Kano, which they made their central depot, and there they were faced by the difficulty of fencing.

THE DIFFICULTY SURMOUNTED.

"There is no bush in this part of the country," explained Mr. Thornton, "so we erected a kind of hedge of guinea corn, binding it together with grass rope, and then inside we dug a trench, which

gave us a fence of about six feet in height. Mr. Smith was left in charge of this while Mr. Bowker went to Lagos to arrange for the transportation of the birds."

Mr. Thornton had arranged with the British Resident of Katsina, in Sokoto, and also with the Emir of Katsina, to bring in all the birds they could. This Emir he found to be a most progressive man, who kept a record of every transaction in writing, and he, with the British Resident, got the birds to Mr. Thornton. A great many of them had to travel over three hundred miles. Having arranged this satisfactorily, Mr. Thornton returned to Kano.

The next move was to send Messrs. Bowker and Smith out east towards Lake Chad to buy specimens in that part, and also, if possible, to secure wild specimens. "They trekked five hundred miles," related Mr. Thornton, "but were unable to secure any wild birds. They saw plenty of spoor, but never came in sight of them or within shooting distance. However, they secured some specimens of feathers. This district is covered with thorn trees, something similar to our mimosa. It is all waterless, but the people who live there have wells and there are a few oases where water is to be found on the surface. On the return of Messrs. Bowker and Smith, Mr. Bowker again went to Lagos to superintend the transportation. Mr. Hewitt, who is at present in the room—a Nigerian official in charge of the railway transportation—was very kind to us, and it is very much due to his personal assistance that we got the birds through to the coast so well and easily."

Mr. Thornton went on to say that the trucks in use on the Nigerian Railways had to be specially altered to accommodate the birds. They had never had such a consignment before in Nigeria. The sailing of the boat had also been delayed for a month, and the trucks were kept in Kano for that length of time, but mainly owing to the good offices of Mr. Hewitt the Union Government was exempted from paying any demurrage.

STRICKEN BY SUNSTROKE.

"Then about a fortnight before the birds left I went down with sunstroke and had to be sent into hospital," the narrator proceeded. "That left Mr. Smith in charge with one other gentleman to attend to the trucking. Had there been one man less in the expedition we could never have trucked the birds and caught the boat."

Proceeding, he said the birds were trucked on the 25th of April, and five days later the expedition reached Lagos, on the West Coast. On the way down they lost four birds. The birds were put straight on board at Lagos.

"Now," he went on, "it had been arranged that the boat was to have all her cargo in when we arrived, and was to leave on the following day; but when we put the birds on board at Lagos we were kept waiting for eight days, two of which were spent rolling in a very heavy ground swell outside, which I thought would kill a good many birds. That is a matter I am going to ask the Government to take up with the steamship company."

Mr. Thornton proceeded to say there was no doubt, if there had been 500 birds which he could have purchased and brought down to South Africa, they would have cost the Government only a little more than did the 150 they obtained. Practically the only additional cost would have been the transportation. Even now the cost had been quite small.

The judging of the birds up north was made exceedingly difficult owing to the fact that all the feathers were removed from the birds, leaving them as bare as the back of his hand. Some were brought to him like that, and he bought them, not being quite sure whether they were the birds required or not. He had some chicks who when three months old had had every feather removed, and consequently the feathers now were stunted.

SPOILED FOR ALL TIME.

The old birds he had with him were spoiled for all time, because they had simply been kept in their tiny compounds all their lives, and their feathers had been taken every four months, with the result that every feather was barred or twisted in every possible way, but any bird with the dense heavy short feathers of the Evans type he took. They found that the feathers that could be obtained from birds east of Lake Chad were very thin, and very much like the feathers of the wild birds to be got in South Africa. Why these birds should be localized, it was almost impossible to say, except that the locality was on three sides surrounded by desert, and it was the only locality in which he could find the limestone formation. Their pecularities were red skins, bald heads, eggs larger than the South African ostriches, but unpocked, and the shell was thinner than ours.

"The people there have farmed their ostriches like that long before this was thought of as a country," commented Mr. Thornton. He added that he had discovered the sender of the original Soudanese birds that had come to South Africa.

TWO INTERESTING STALLIONS.

A gentleman in the audience requested Mr. Thornton to give them some information regarding the two stallions brought down by the members of the expedition.

Mr. Thornton said that they were to be procured in a place about 500 miles north of Kano—a chain of villages of which Agadez was the chief, inhabited by the Taurek tribe. "The Taureks," he went on, "are most treacherous and pugnacious, always raiding as far as possible; but there is no country, I suppose, in the world where woman's suffrage has been so highly advanced as that of the Taureks. The woman is absolute master. If a raid is organized, the women organize it, and send the men away to carry it out; and the men must not stay out late at nights." (Laughter.)

Continuing, he said that these horses (Asbens) had been bred for centuries and centuries and kept absolutely pure. The Taureks were the descendants of the Saracens who fought in the Crusades during the time of Richard Cœur de Lion. Every mare was owned by a minimum of five men, each of whom own a share, and the Emir will not allow the sale of a mare or the share of a mare except to a fellow tribesman. The only way they were allowed to trade with mares was by means of camels.

MARES WITHOUT PRICE.

"Taking the cost of a camel at £5," explained Mr. Thornton, "it would take from £150 up to £250 to buy a mare; but an outsider cannot buy them at all. Just as a test, I asked a man, 'Supposing I give you £2000, can you buy me a mare?' He said 'It is absolutely

impossible.' But the stallions can be obtained through the Emirs. Some say that the pedigrees of these horses are handed down from one generation to another, and the Emir said that the pedigrees were always kept in writing just as those of the oldest chiefs are. These pedigrees are kept all from the female side, because the Taureks trace everything from the mother. They have nothing to do with the father there. (Laughter.)

"The Taureks place the Asben horse a long way above the Arab, and assert that it is an older breed. I asked one Arab why they preferred these horses to any others, and he said, 'for the simple reason that you can do a journey (by which he meant 140 miles) which would take an ordinary horse four days—with an Asben they could do it in one.' 'I then asked him: 'Why is this?' His reply was characteristic of the country: 'Allah made them so.'

"That has been so for centuries," proceeded Mr. Thornton. "I have no doubt in my mind that the Asben horses can be traced far further back than our own English thoroughbred strain in England. The black stallion I procured seemed to have a true pedigree, which is being forwarded to me by the Director of Education in Northern Nigeria."

Mr. Thornton added that white stallions (Mr. Bowker's horse is white) were very difficult to obtain, as they are preferred by the tribesmen, and they were not quite sure whether Mr. Bowker's horse was a pure Asben.

Mr. du Toit said he thought they had to thank Mr. Thornton for his address. There had been a great deal of curiosity shown in regard to the expedition, and he thought this would satisfy this curious curiosity.

Senator Munnik remarked that Mr. Thornton had run very great risks and had suffered great hardships and privations, and had shown himself to be a public servant with the interests of the public at heart.

The meeting then dispersed.

SENATOR SOUTHEY'S OPINION.

Many opinions have been published concerning this shipment of ostriches and among them the following, given to the *Cape Argus* by Senator the Hon. Charles Southey, an experienced breeder of the Midlands of the Cape, seems to cover the whole of the ground. Mr. Southey considers the expedition has been a success and that South Africa will benefit hugely from the results.

"Years ago," he explained, "Messrs. Mosenthal, of Port Elizabeth, imported a number of birds. No one then knew where they came from, but to-day we find that our Cape birds have been vastly improved in quality and plumage as a result of the introduction of that strain. These were Barbary birds, and they got mixed up with our South African birds. To-day the feathers which are most prized by experts are the feathers with the double fluff. This double fluff is contracted from the birds brought in by Messrs. Mosenthal from Barbary. We ostrich farmers only discovered two years ago that the birds came from the North of Africa and were known as Barbary.

We then approached the Government and requested them to send an expedition to the North of Africa, in order to get a supply of these birds and thus renew the strain of this double fluff."

"Then you maintain the expedition was necessary?"

"Certainly, it was necessary in the interests of the ostrich feather industry. The Barbary birds, introduced many years ago, have proved our best strain."

"Is there any danger of new diseases being introduced through them?"

"I say no, and I say this after examining them. To my mind the birds looked perfectly healthy and splendidly grown. I was most favourably impressed by their appearance. I was also impressed by their plumage. Their plumage has the double fluff which we desire. They are the same type of bird from which we got our original strain. I notice that one of your informants states that our ostriches do not require any new blood. Well, I think the new strain will do good."

GOVERNMENT ENTERPRISE.

"Then it is stated," proceeded Mr. Southey, "that the Government should have taken all ostrich farmers into their confidence. Well, I can tell you that Government did discuss this question with the leading breeders, and they have discussed it for the last two years. At least, we have been discussing the matter with the Prime Minister, and urging the Government to send an expedition to the North of Africa, to get the birds before some other country stepped in. We wanted Government to get them first."

"Other countries can get them now?"

"Yes. We cannot prevent other countries coming in now, but we desired to get the best strain first so that we could keep up our immense superiority. South African birds can now be kept ahead of those of all other countries."

SECRECY.

"There was a mystery about the expedition?"

"Yes, of course. We were bound to keep the whole thing secret, lest it should get into the papers. Now we have secured the pick of the birds."

"All the best birds?"

"At all events, Mr. Thornton thinks so. He says we have secured the pick. There is only a limited area in which these birds can be obtained. By securing what we have I think we have got a further step in advance of any other country, and by improving our breeds we hope to keep ahead of all other countries—Australia as well as America. The Government tried to keep the matter of the expedition secret, but it leaked out. Even now no one knows where the birds came from except a few, and so the expedition has been successful in all respects."

"Would you say that these birds are better than any we possess?"

"No, I would not say that. We have as fine birds in the country. Still they are fine vigorous birds and come from the class from which we built up our best."

CLIMATE.

"How do you think they will stand the climate?"

"I think they will be all right. This is a great ostrich country, and an ostrich will stand cold all right. What he does not like is wet cold."

"And what about disease?"

"Some may be nervous about that, but I am perfectly certain that we shall have no trouble from these birds."

"I should like to add," proceeded Mr. Southey, "that all the leading progressive farmers are perfectly satisfied that the Government have done the right thing, and that this shipment is going to benefit the whole country. I do not think the expedition cost too much. The outlay will be repaid by the improvement in our feathers. I expect a great deal from these birds, and I believe they will increase the value ot our exports considerably."

DISPOSITION OF THE BIRDS.

"What is going to be done with them?"

"I do not know, but I advised General Botha to keep the chicks until they are old enough for farmers to judge of their quality and satisfy themselves as to their value. As regards the grown birds, I think the Government should keep them at Middelburg (Cape) and let them breed, and then put the chicks up either to tender or auction. Farmers will be able to judge from the parent birds what the progeny is likely to be."

"We have got," added Mr. Southey, "all the good birds there are in the area. It is reported that there are many others in the desert in which no European can penetrate, but in the area where the birds are to be seen we have got the pick. We are so far ahead of other countries now in ostrich farming that even though they now get shipments from the North of Africa we can keep ahead of them. We have the double fluff feather. They have not. This new shipment will help to cultivate that double fluff, and it will take years for any other country to catch us up. In point of fact," added the speaker with emphasis, in conclusion, "I do not think they will ever be able to catch us up."

White Ants in Buildings, Orchards, and Plantations.

SOME RECENT CORRESPONDENCE.

THE following correspondence which has taken place between various private inquirers and the Division of Entomology on the eradication of white ants is published as being likely to interest readers of the *Journal* who are troubled with this pest.

In reply to Mr. H. Rix, Good Hope Farm, District Rustenburg, who states that he is very much plagued with white ants on his farm, and asks for advice relative to the extermination of the pest—suggesting at the same time the possibility of the use of coal-tar mixed with the mortar when building being effective as a deterrent—Mr. Claude Fuller, the Natal Entomologist, wrote:—

In reply to your letter of the 18th instant, I would refer you to the answer addressed to two other inquirers for information on the subject of white ants, a copy of each of which is sent you herewith.

I shall answer your direct question first, and say that I am certain that the mixing of coal-tar with mortar would not act as a deterrent, and the adoption of such would only amount to so much waste of good money.

The keeping of white ants out of a building is a matter which involves anticipation of their attack in erecting a building. In other words, the rendering of the building white ant proof. I have lived practically all my life in districts where buildings were subject to the attack of these insects, but nowhere more so, I might even say more extraordinarily so, than in Natal. During the past thirteen years that I have resided in Pietermaritzburg I have investigated one case after another of white ant attack in private residences, and nearly as often have been able to advise sufficiently well for successful treatment. But with all this personal experience (in no less than three cases I was actually residing in the infested places) I cannot lay down any hard and fast rules. In other words, a careful examination of the building and the manner of attack is always necessary before measures can be recommended which are likely to give fairly immediate relief. This is largely due to the fact that houses are so differently constructed, and as we have very nearly fifty different kinds of white ants in South Africa some probably work in diverse ways.

Indeed it would only be by recounting one personal experience after another that I would perhaps be able to give you any clue as to how to set to work to meet a specific attack. At the risk of proving wearisome, I will describe several which just now occur to me.

No. 1.—In this instance I was living in a brick cottage, its foundations were of slate and the party walls of green brick. One evening

after nightfall we found the sitting-room full of flying ants which were emerging from a hole high up in the party wall. An hour or so later they had bored a hole in the floor—and linoleum—of the next room, from whence a further army of winged ones emerged. Beneath the floor we found that they had built a mound nearly 3 feet in height, and it was from the summit of this they were emerging. The party walls were found riddled with their galleries, and it was discovered that they had built a covered way *over* the foundations to gain access thereto. The damage done to the house was not excessive, being confined to some of the skirting and ceiling-boards. This was probably due to the fact that plenty of food was accessible to them in the soil surrounding the house and also in the green brick of the party wall, as in the making of the bricks grass had been used and the clay also contained a considerable amount of humus. This nest was dug out, more than half a dozen barrow loads of soil being removed. Subsequently the soil under the one room was thoroughly saturated with a solution of arsenic, and although many years have passed there has been no further attack. This house, it must be remembered, was in town and in a part which has long been built over, and termites are not common. It showed, however, how attractive green bricks were to the insects and also that they were quite able to gain access to a raised floor or wall either by mound-building or by building a gallery over stone work, and that some cases of attack are easily dealt with. A feature of the place was that it was dark and dank beneath the floors owing to inferior ventilation.

No. 2.—This case was one of a brick cottage, built obviously to sell and set down in a new part badly overrun with white ants. All that was done to prevent attack was to dig out the nest upon the erf on which the cottage was erected, whilst those just outside the boundary were neglected.

No particular care was taken to raise the foundations high above the ground level; beneath was dark and ill-ventilated, and the inner walls were all of green brick. Before the house was six months old the walls were well inhabited and the wall-paper eaten away in large patches. The case was a hopeless one to deal with from the start and no treatment was attempted. But, curiously enough, after reaching a certain point the attack stopped, and, except that the white ants occasionally do some mischief to show that they are still present, the attack has never developed into anything really serious.

No. 3.—This was a very large residence and well built, and the damage was confined to the skirtings, floors, and window frames of the front rooms and hall. The floors were well raised from the ground and the sub-ventilation excellent, plenty of air and light being able to penetrate beneath it. The consequence of this was a direct deterrent to attack of white ants—the soil being fine and dry was not to their liking any more than the light. No nests or their indications could be found any whereabouts, and only one conclusion could be arrived at. Along the front and one side of the house ran a wide, tiled veranda. To make this, soil had been filled in between the foundations and the tiles were set in a thick layer of cement. All seemed white ant proof, but it was not so. A nest had been established beneath this tiled veranda, and, by the discovery of interstices and cracks in the cement, the white ants had found means of gaining access to the woodwork of the house, particularly that of the front door,

where indeed the mischief first started. Here was a lesson learned, and in quite half a dozen other instances where a good deal of thought had been given to the prevention of attack in building it was found that the insects either nested directly under these earth-raised tiled stoeps or gained access to the house through them.

In this case the attack was only circumvented by boring a regular series of small circular holes through tiles and cement into the soil and making regular applications of carbon bisulphide, pouring into each hole a uniform dose and plugging the hole with a cork.

In an almost parallel case I decided that the termites were not nesting under the veranda, but gaining access to the house—which was supposed to be white ant proof—through it, there being four or five large nests in close proximity. No effort was spared to destroy these, but even when done the attack still persisted, and it was only by applying the above treatment to the veranda that success was ultimately attained, showing that a nest had been located there.

No. 4.—The last case I will mention was one of a house built with much care and thought to exclude white ants. The floors in front were 2 feet 6 inches from the soil, and at the back 4 to 5 feet. Access to the whole of the interior below the floors was provided for, the whole of the ground surface was concreted, and the inside walls of the foundations well cemented. Beneath the house, of course, the ventilation was good, but as no light could penetrate it was quite dark. The tiled veranda had the usual earth filling, but it was more than usually carefully done. And yet an attack of termites eventuated, being found in the flooring of the sitting-room. I should add here that about once a month an inspection of the foundations was made, and in one of these it was found that the termites had found their way through a small opening in the cement (one can scarcely concede that they made it) and had built a covered gallery 2 feet up the wall of the foundation. This entrance was effected opposite to the earth-filled veranda, and was a further illustration of how futile it is to build a house ostensibly proof against their attacks and then provide their means of access. But the attack in this case, at first mysterious, was found to have come through one of the brick wells built to support the hearth-stone which, instead of being left empty or protected in any way, had been filled with brick bats and, incidentally, pieces of wood and wood shavings—tasty bits to encourage the termites further to the better things above.

Apart from these experiences, I have met with cases where houses have been attacked from nests which were quite distant (one quite 90 feet away), and in still another case the house itself seemed to be the nest, the queen being found ensconced under the hearth-stone.

What these illustrations all go to show, however, is that one must think around and look around before attacking any particular problem of their attack upon a house, and that operations have to be carried well afield in dealing with an attack. Further, that one must build carefully and well, even a brick or stone house, to prevent these blind creatures finding an access thereto where man's brains have failed him, because, perchance, he did not credit them with the full potentiality of their marvellous instinct which patiently seeks and finds the flaws in his ingenuity.

However, from it all we may postulate a little and say that in building a house we must make ready provision for getting below the

floors to deal with any attack we may fail to circumvent, despite our best endeavours. We must provide plenty of ventilation so that the soil may be kept dry and make the ventilators large so that the daylight also may penetrate beneath; indeed, do no more than will make the house a healthy one to live in. At the same time, if we wish for flag or tiled verandas, these, like the floors, should be clear of the soil, building on reinforced concrete for preference, and allowing light and air also to penetrate beneath.

The two following are the inquiries, and replies thereto, referred to in the first paragraph of the Natal Entomologist's communication; and to have the subject more fully dealt with, an earlier inquiry and the answer given to it are also appended:—

I.

Will you please let me know:—

(*a*) From the experiments which you are conducting, what is the best ant-resisting application in the case of ordinary deal or pine wood which has to be placed in the ground in wood and iron buildings?

(*b*) What application best preserves such wood from decay?

(*c*) When white ants have attacked fruit trees, do you know of a remedy?

(*d*) How may the ants be prevented from attacking fresh trees?

D.

Bloemhof.

REPLY.—(*a*) To prevent the attack of white ants upon pine which has to be placed in the ground, the best course to pursue is to have the same either soaked for a couple of days in a 10 per cent. solution of arsenite of soda in water or well creosoted. This will provide the greatest degree of resistancy to attack. Charring of such portions of poles or props as have to be sunk in the ground is a common Australian practice, but the expedient can only be resorted to in certain cases, and is futile unless a large extent of the charred portion extends out of the ground.

(*b*) Creosoting and charring both preserve such wood from decay, providing of course it remains dry and does not become cracked.

(*c*) When the attack of white ants on fruit trees is discovered, the mischief wrought to the tree is usually so complete that no remedy applies. What I mean to say is that in all the cases which have come under my notice the underground roots were secretly destroyed and the attack only discovered when the ants had started on the exposed bark of the crown or by the dying or death of the tree. In that sense, therefore, there is, in practice, no remedy.

Incidentally, I would mention that I have never seen peaches destroyed by these insects, and so where they occur plums on peach stocks should always be planted.

(*d*) So far I know of no application to the soil which will prevent white ant attack indefinitely. Constant working acts as a deterrent, and the forking in of vaporite around the base of the tree or the watering of the soil there with copper sulphate solution are both said to act as temporary deterrents; but, as such have to be frequently applied, perhaps weekly, they are scarcely describable as "economic." Constant watering is also said to act in a like manner, but I cannot speak of its efficiency from personal experience; nor is it always practicable.

Speaking from a good deal of personal experience with white ant attack in orchards, gardens, canefields, and buildings, I can only say that one must keep worrying away at them by every possible means for some time and then success will come. In short, one destroys the bulk and drives the rest away. Termites like quietness. Hence their general absence from towns, and the fact that inhabited houses—even those most susceptible to attack, such as the huts of natives and Indians—may remain intact and are, when empty for a short time, literally eaten up.

I know, indeed, of many cases of severe depredations which have taken place to houses when the family was away for a month's holiday. This is, however, by the way.

The greatest means at hand for the destruction and worrying of white ants is a machine called the Universal Ant Destroyer, by the means of which arsenic and sulphur fumes are pumped from a firebox through an iron pipe into the galleries of the nest. These fumes, if well applied, penetrate to all parts and poison the nurseries or feeding-grounds of the young, and the insects which they come in contact with, in a most effective manner.

Known nests are readily destroyed so long as a few galleries of half an inch or more in diameter can be located into which to drive the fumes. As a commencement, one locates and treats all such nests as can be found in the vicinity of house or orchard. This, of course, is best done before the ground is turned over and the mounds removed, simply because many species, once their mounds are removed, do not give further visible evidence of their presence in the soil. Where these landmarks have already been removed one has to resort to the following up of such evidences of their presence as are indicated by their mischievous work.

Thus, for example, where a tree is destroyed, the ground must be carefully spaded out, when one or several galleries will be found leading to the nest. To these the pump treatment is applied, a careful lookout being kept for any escape of the fumes through previously unobserved openings in the soil, with a view to locating the site of the nest. The pumping into these "foraging galleries," as I might call them, may not always be successful of course; it is very seldom, however, that one is unable to locate the nest thereby and dig there for further arteries which enable us to treat it effectively. The ridding of any given locality or even a building of white ants may take a deal of time and much worry, but it is not an impossibility.

CLAUDE FULLER,
Natal Entomologist.

II.

As we have had a tremendous lot of trouble with the above here, I venture to ask your assistance in the matter. The trees in question are mainly casuarinas and eucalyptus, and are planted in a shelter belt with grass growing on either side, but the ground round the trees has been cultivated and stirred. Also all adjacent ant-heaps have been dug out and the queens destroyed and refuse burnt in the holes, but this appears to have no deterrent effect; they simply start building again. Also they seem to make small nests in the adjoining grass. I suppose this grass should be ploughed up, but do not know

whether this would be possible. In addition to above a solution of carbolic sheep dip has been placed round each tree. They don't like this, but as the smell evaporates they start again. Also a mixture of Cooper's Dip, sugar, and mealie meal has been placed round each tree, but still the destruction goes on.

I am aware that there is an instrument for pumping fumes into the ant-heaps. This will probably be purchased, but as the ant-heaps have all been dug out in this particular place I suppose it won't be much use.

As there is a considerable amount of tree-planting projected here (100,000 for next season) I shall be greatly obliged if you will give me your assistance in this matter, including life-history of insect. Although I have been twenty-three years in various parts of South Africa I have never experienced such trouble before. The ground here is extremely sandy, in fact almost pure sand.

R.

Vierfontein, Orange Free State,
24th April, 1912.

REPLY.—First of all, I will say that your experience subsequent to the destruction of the nests and the digging out of queens is by no manner of means an unusual one. So much so, indeed, have I found it to be the case that I have begun to look upon it as a futile method. I do not deny that any good is accomplished, but I do say that this treatment gives a sense of false security for the time being, and makes the subsequent attacks of the insects all the more harassing.

We in Natal have experienced a great deal of trouble from white ant attack in wattle plantations and in young orchards, and it is because our planters have met with so much success in dealing with white ant troubles that I feel sure that with one who is prepared to take the amount of trouble which your letter indicates you are, a large amount of success will follow; more especially where I can give you this encouragement that other practical men have, by consistent effort, arrived at what they regard as a satisfactory solution of the difficulty.

I cannot enter here into the life-history of these insects, and if I did I could only generalize, because there are so many kinds, and as many variations in their economy must exist. Furthermore, the biology of our termites has had but the most cursory study. Indeed, it is a complex subject involving a life's work of study which no South African entomologist has yet had the opportunity of even embarking upon.

I can say, however, that whilst the life of a community appears to depend upon the presence of the queen, there are species of which the queen is unknown, and again, in many instances, where nests have been dug out and the queens and nursery beds destroyed, the remnants of the community have been able to start afresh and multiply. In some cases I know this has been because small supplemental queens have been overlooked, and further, because there is much evidence that in some species the female workers are able, under such a state of affairs, to produce young. Indeed, only the other day in digging over the ground from which a nest had been removed I found a small fungus bed no larger than a small apple, obviously the foundation of a new colony by the termites which had escaped destruction in the removal and treatment of the original nest.

It occurs to me here to attempt to answer the question as to why white ants do attack trees. In illustration, I have in mind a particular case where a considerable amount of scrub was cleared and burnt, ploughed, and beautifully prepared and then set out with fruit trees of many sorts. Practically all were immediately destroyed by the termites, including mangoes, avacado pears, and oranges, trees ordinarily never attacked on the coast lands of Natal. Now the reason for this is not far to seek, for the agriculturist had first carefully removed all the natural food of the insects which existed in superabundance—fallen leaves, dead twigs, stumps, and the like—and left the ants nothing to feed upon. Parallel cases are often to be found upon the coast where land is first set out to sugar-cane, the plant cane suffering quite a lot owing to the fact that the natural food grass and scrub has been largely removed in ploughing the land and preparing it for planting. At the same time, miles of sugar-cane fields stretch east and west, north and south, growing in soil riddled by white ants without a sign of damage, simply because the débris of cane growth supplies a sufficiency of food which is, to them, preferable to the living cane.

Going by the contents of your letter you will have to deal with your termites in three different phases of work, and to this end you will require one or several of the Universal White Ant Exterminators with which to keep on pegging away and worrying the ants.

First of all we will take the case of the land you intend to plant the next season. This must be taken in hand at once, and as many nests as possible located and destroyed with arsenical fumes. By this means you will considerably reduce the army of the enemy, but I cannot promise that you will be absolutely successful, because I have never known the treatment to be absolutely so.

You will have to follow it by further attention when the trees are set out, and this will apply to your present predicament. It consists in training a man to be able to detect the surface workings of the white ants. These are little earthen galleries or covered ways on the surface of the soil, a following up of which will enable you to locate a nest which cannot otherwise be found. The simplest way to so track the nests is to use the pump. A break is made in such a run, the nozzle of the pump being applied thereto, the fumes are gently puffed in; then, by watching the smoke arising from the numerous orifices, the gallery can be followed up in one direction or another from the break, and carrying the pump from spot to spot and continuing the operation, the nest can be found. This may seem a tedious operation, but as a rule one boy in a gang, either Indian or native, will be found with sufficient intelligence to become quickly adept in the method.

In a letter I have before me a leading wattle grower remarks:—"I have done 6000 acres with the pumps, and speaking without the least exaggeration, have made white ants a negligible quantity, not only among the original plantations, but for the second crops on the same fields."

The third phase of the work will be tracking down a nest from a tree which has been destroyed by digging carefully, and finding the gallery or galleries leading therefrom to the nest.

In dealing with nests in the veld those which do not possess a natural opening must be spaded away until a gallery ¾ to 1 inch or more is exposed into which the fumes can be pumped. In the case

of the larger openings or flues which characterize some termite nests, after the nozzle is inserted, the rest of the opening should be closed with a wad of thick mud so as to prevent the fumes working back.

After pumping many nests for some little time smoke will often be observed issuing from unlooked for openings in the soil—perhaps many feet away. These should not be closed immediately, in order that the fresh air may be driven out of the nest and to provide for a current of the poison fumes through it. When such openings are large, it is desirable to mark them and subsequently work them with the pump.

Care must always be taken to keep the pipe of the pump from clogging, and it will be found also that small galleries frequently become clogged in working, and it may be necessary to open them out—a matter easily attended to, as they are easily traced through the soil by the conspicuous deposit from the fumes. A little experience in the work will show when pumping is to be discontinued. It is not advisable to set a time limit.

CLAUDE FULLER,
Natal Entomologist.

III.

Could you kindly cause to be sent to me full particulars of the above in relation to the damage they do to trees and plantations, including their habits, method of living, size and depth of their nests, etc., and specially whether they

(1) *Reside under* a tree when destroying it? *or* whether they leave the nests at such times and travel? If so, what distances?

(2) The remedies and methods to exterminate them? *Not only* in lands before trees are planted, *but* also in plantations when and where one sees a tree uprooted and killed by them (that root eaten through).

F.

Rosehaugh, Transvaal,
20th November, 1911.

REPLY.—I am writing you at as great length as possible, and if I fail in answering some of the questions you raise, it is only because a full reply to some of them would involve the writing of a booklet.

I will say at once that white ants do not necessarily reside under the plants which they attack, but will travel quite long distances from their nests to attack trees. In wattle plantations they may often be found residing under the trees they attack, but this is because the trees have been planted over their abodes.

Damage by white ants is not necessarily a natural adjunct to wattle culture, and it is by no means every wattle plantation that suffers from their attack. Where damage does occur it can be laid down as an axiom that the insects were inhabitants of the particular piece of land under wattles when that land was bare veld. Speaking generally for Natal, a certain proportion of the trees in the majority of our plantations are lost from white ant attack, the proportion depending of course upon to what degree the land put under wattles was favoured by white ants originally, as it is well known that these insects do not favour any and every sort of veld. So far as my observations go, I do not think that any injury is done by white ant

colonies which establish themselves in an existing plantation, nor is there anything to fear from such colonies. The injury to original plantations occurs in the first three years, and where no precautionary measures are taken this may run up to even 30 per cent. of the area planted, the trees as a rule being killed out in the patches about the homes of the insects.

What happens is that in preparing the land for wattle growing the numerous colonies of white ants are disturbed and their natural food supplies rapidly shortened until little is left for them to attack but the growing trees, and this they do by destroying the roots. Their natural food is, of course, dead and dry wood, and their work upon living trees may, to a very great extent, be directed by the desire to provide this favourite form of subsistence.

The damage is only continuous until such time as the soil is sufficiently littered with the débris of the trees (leaves, flowers, seed-pods, and twigs) to satisfy their wants. Unfortunately, however, it is just before this period, when the trees have become of a more enhanced value, that the termites are driven to find fresh food supplies, and then the destruction of one fine grown tree has a much more depressing effect than the death of fifty young seedlings.

However, so far as Natal is concerned, few wattle plantations are nowadays set out without some preliminary attention to the white ant factor, nor managed during the first few years of growth with eyes shut to their potentialities.

In preparing the land for cultivation of any sort the mounds which indicate the sites of most nests are obliterated. These mounds represent the bulk of the soil which has been excavated in the formation of the subterranean nest and its galleries; and, naturally, the inhabitants have not always the occasion to build a fresh one. Then again there are destructive species which do not build conspicuous mounds, the soil being brought to the surface and spread so loosely that it is easily scattered by wind and rain.

In taking precautionary measures it is first of all essential to go thoroughly over the lands before ploughing and destroy all the nests that are visible; that is, such as may be recognized by mounds, funnels, or low wide elevations of the soil surface. This can only be done economically and at all effectively by the use of that well-known machine the Universal Ant Exterminator, with the aid of which fumes of arsenic and sulphur are pumped into the nest. In this connection it is of course necessary to give attention to nests adjacent to the site marked off for ploughing, any in fact within 100 feet or so, because termites drive their galleries great distances through the soil. To what exact distances afield they go it is impossible to say, but in two instances galleries of 90 to 150 feet were noted.

It is not always an easy matter to trace all the nests in the open veld, and unfortunately with us in Natal the most destructive species, although its workings go down into the soil for at least 100 feet, constructs practically no superficial mound.

After the preliminary treatment of the veld it is necessary for the wattle-grower to be quite on the alert and watchful for any evidence of white ants during the early years of the plantation's existence. The discovery of the nests, if not simple, is then at least more certain. This because the species just referred to makes, after the soil settles down, little, fragile, covered runs or galleries over its

surface. These should always be looked for where any damage has become evident, and when found they can be followed up without difficulty by the aid of the exterminator. The nozzle of the machine is placed on the run and the smoke puffed gently into it, then by watching the smoke arising from the numerous orifices the gallery can be followed up and the nest located.

Writing to me recently one of our largest growers of wattles remarks: "I have done 6000 odd acres with the pumps, and, speaking without the least exaggeration, have made white ants a negligible quantity, not only among the original plantations but for the second crops on the same fields." My correspondent's plantations are situated in as bad a district for termites as any I know of, and so what one man can accomplish many can do.

The exterminator machine is readily obtainable, and with a little care and practical attention, particularly in cleaning out the iron hose so that it does not become unnecessarily clogged, and guarding against too rough a handling of the force pump, which perhaps is a bit too light in structure, the machine will see through a lot of service. An excellent and effective powder for using with it can be prepared by mixing thoroughly together 25 lb. of flowers of sulphur with 75 lb. of fine white arsenic.

In treating such nests as do not possess a natural opening, it is best to spade away the mound or the earth until a gallery of ¾ to 1 inch in diameter is exposed, into which the fumes can be pumped. In the case of the large openings or flues which characterize some nests, after the nozzle is inserted the rest of the opening should be closed with a wad of thick mud.

After pumping has continued for some minutes the smoke will, as a rule, be observed issuing from other unlooked-for openings, and these should not be closed until all the fresh air has been driven out of the galleries and nests. Frequently, also, it is advisable to mark the larger of such openings and subsequently work them with the pump. All conspicuous openings from which no smoke escapes after pumping well should, of course, be treated separately.

For firing, charcoal is undoubtedly the best, and care should be taken to get the fire well alight in the fire-box before the powder is placed on top of it. Where charcoal is not readily obtainable dry cowdung can be used as a substitute, but as it burns quickly away a good supply should be kept on hand where any extensive work is to be done.

CLAUDE FULLER,
Natal Entomologist.

29th December, 1911.

Spiders.

By Nendrik Abraham.

A paper read before the Natal Scientific Society, November, **1911.**

The purpose of this paper is to record some of my observations made in studying the life history of three of our South African spiders. I cannot venture to deal with more than three species in this paper, and my notes must even now be very much curtailed. South Africa is the home of a great number of remarkable spiders, and the careful study of the life history of many of them will abundantly repay the earnest student. I want, first of all, to introduce to your notice the tree trap-door spiders of Natal. It is now some thirty years since I made my first discovery of these spiders in the Cape Colony. The specimens I then sent to South Kensington were, I think, the first received from this country, and a prominent place was given them in the spider collection of that great National Museum. Two species of these spiders are known to me in this country, viz., *Moggridgea dyeri* and *Moggridgea abrahami.* The latter is plentiful in some parts of Natal, Durban being a favourite locality. The sub-family Miginal has been established for the reception of three genera, Moggridgea (South Africa), Migas (Australia and South-West Africa), and Myrtali, whose single species, *M. perroti,* inhabits Madagascar. The chief characteristics of the spiders belonging to these genera are their downwardly-directed Chelicerae, and that they inhabit trees, either boring holes in the bark or constructing a wonderful retreat made of silk and particles of bark, and furnished with one or two trap-doors of very perfect construction.

In order that you may have a fair idea of the kind of structure made by our South African Moggridgea, I will ask you to go with me to some likely tree, say, an old "kaffir boom". I will there point to a spot on the bark and ask you if you see anything peculiar about it. After a careful examination you will in all probability answer in the negative, or you may say, I only notice a patch of lichen. Taking a penknife and asking you to observe closely, I insert the fine point of the knife under a piece of the lichen, and using a little gentle force, a door is made to open revealing a kind of smuggler's cave, very beautifully constructed, and containing a solitary inhabitant, the keeper of the door, the ingenious spider. Asking you still to look with attention, I again insert the point of the blade at a place about an inch and a half from the former point of intrusion, another door opens which reveals the secret way of which the spider escapes from its enemies, should the first door be forced. Immediately I remove the blade the door is shut down, and you are left wondering if your eyes have deceived you, for now no sign of door or den is to be seen, and all things are as they were before. The bark and the lichen are there but not the faintest sign of a smuggler's cave. For a moment

you are filled with wonder and admiration, and as you look at the spot on the bark and try to see some trace of the spider's retreat, you instinctively say: "However did you find it? How did you know it was there?" And as you still look and wonder you think of the old story of Ali Baba, and instinctively the words "open sesame!" come to your lips; and when the doors are open for you again your admiration for the skill of the little engineer is still more increased as you notice how perfectly the doors fit the openings they have to cover and hide and how cleverly they are concealed. I have often placed in the hands of friends a piece of bark only measuring 5 inches square, and asked if they could detect anything unusual. After a long look the answer has come: "No, we can only see some lichen!" And yet right under their eyes has been the retreat of the spider, measuring about 2 inches long with its two doors, each only a little smaller than a threepenny piece. The homes of these spiders form one of the most interesting instances of skill and ingenuity among the invertebrates. The spiders now under consideration do not burrow into the wood of the trees; they take advantage of the crevices or irregularities in the bark and shape these to necessary dimensions, making the floor of the crevice quite smooth. The spider commences to build by weaving together pieces of bark and other substances found in the immediate neighbourhood of the proposed structure. In this way a covering is thrown over the crevice and affords immediate protection for the spider. After a time the trap-doors are added to the structure, and when the work is finished it is, in many cases, almost impossible to detect any difference between the retreat and the surrounding bark. At times the spider will construct a more prominent and more easily detected structure, but this is only the case when the conditions of the bark are unsuited for concealment.

I have had a number of spiders under observation for many months, both in their natural haunts and in captivity. Being anxious to know how the doors of their retreats are constructed I procured a stump of a tree and drilled several holes into it through the different surfaces presented in different parts of the stump. Into each of these holes I introduced a spider. During the day time they all remained quite motionless in the ends of these holes, but on visiting the stump the next morning I could not find one of the holes until I had made a careful search. I then found that a beautifully constructed door had been fitted over each of the openings and that each door corresponded perfectly with the surrounding bark. One hole had been drilled through a piece of growth of lichen; the door in this case was made to correspond so perfectly that the lichen looked undisturbed, and only after careful inspection could the outline of the door be detected. In another instance some little pieces of wood, left by the drill in the border of the hole, were woven into the door. At first the doors are very thin, like paper, but the spiders increase the thickness by adding layers of silk on the inside. In this way the sides of the house are also strengthened, the whole being quite firm and strong when completed.

On attempting to lift the doors of these houses the spiders often hold them down with great firmness. Knowing that different opinions have been held by naturalists in regard to the methods used by trap-door spiders, in general, for holding down the doors of their retreats, I took special care to observe how these trap-door spiders accomplished this act of defence. I was quite satisfied that the mandibles grasped

the door and the legs the side of the house. In one instance, when the spider held down the door very tenaciously, I was enabled to fix open the door a little way, and with the aid of a lens I could plainly see the mandibles buried deep in the silken door. I have often found the doors fastened down with strong fastenings of silk. In such cases the spider would be resting and trusts to the strength of the fastening to keep the door or doors closed against intruders. Being anxious to see how these spiders capture their prey I put a few grains of sugar near one of the doors. Two ordinary house flies alighted on the sugar, and while they were feeding the door of the spider's retreat was thrown open with a slight click, the spider darted out, caught one of the flies, and retired with wonderful quickness. The whole transaction was done with such rapidity and dexterity that the other fly, though nearly touching the captured one, was undisturbed, and seemed to be quite unconscious of the fate of its companion. I have observed one other capture and this also was carried out with the same extreme dexterity.

The eggs are placed in a small silken bag at the bottom of the retreat. When the eggs are hatched the young live for a considerable time in the home of their parent. They, however, quit the home while they are yet very small, and build for themselves minute but perfect retreats furnished with wonderful doors.

The greatest enemies these spiders have are the various species of ants which infest trees. If it were not for the wonderful protection afforded them by their beautifully constructed homes they would soon be all destroyed. The trees selected by the spiders for building their retreats are generally old trees with rough bark, though not that kind of bark which is friable. In some trees with rough bark they are never found, as the nature of the bark is not suitable for their purposes. The oak tree is a favourite with them. In my collection I have specimens taken from about seven different kinds of tree. One specimen is from a screwpine. In the Durban Museum are several fine specimens of these structures from Zululand. I have found them in several places in the Cape Colony as well as in Natal.

The next spider I wish to introduce to your notice belongs to the genus Desis; it is a marine spider, and lives below high water mainly in coral reefs and other formations, coming out to hunt upon the rocks at low tide. During high tide they find shelter in silken structures impermeable to the sea-water, and securely placed in some well-protected hole or crevice deep down in the rocky structures where they live.

It was in the year 1898 that I made my first observations on these spiders. I sent several specimens to the Derby Museum to be identified. In the *Bulletin* of the Liverpool Museum, published October, 1898, there appeared an illustrated article, entitled "Descriptions of a New Marine Spider from South Africa, collected by the Rev. N. Abraham, and presented to the Derby Museum". From that article I copy the following extract: "The existence of marine spiders, living in rocks on the shore, is no new discovery. Several have been described from various parts of the Eastern and Australian seas, and one has been recorded from South Africa. No account, however, was given of the habitat of this spider, so it may be fairly claimed that the species forming the subject of the present paper is the first spider certainly known to be marine that has been recorded from Africa."

I will now tell you how I got my introduction to this particular spider described in the *Bulletin* of the Liverpool Museum. While

spending a holiday on the coast, near Capetown, I noticed that many of the rocks were in places covered with those curious structures made by the tube-making sea-worms called tubicolae. In some places there were masses of this tube structure, and I found that many curious creatures could be collected by breaking up a portion and searching among the fragments. A friend had previously told me that he had found spiders when looking for specimens, but as he had no interest in spiders he had done nothing more than notice their presence. I therefore determined to make a thorough hunt for marine spiders. I undressed, and armed with an iron bar and hammer, entered into the sea, and was soon among the breakers, which were dashing over the rocks. After being nearly washed away by a big wave I succeeded in breaking off a large fragment of the curious compound of sand and broken shells which the sea-worms cement together in the form of tubes and in which they live. On reaching the shore with my burden I commenced to carefully break it up, and never did a diamond digger watch more eagerly the breaking up of that conglomeration of sand tubes. What a lot of strange things I saw! How many curious forms of life found shelter among the tubes of the tubicolae! But I wanted to sight a spider. I had almost come to the conclusion that I must try again on a new piece, when, to my joy, I saw a spider in length about three-quarters of an inch, including legs, run out from a piece of the material I had just crushed. Yes, there it was, a spider which to a cursory observer might have been taken for an ordinary specimen such as we find under stones in our gardens. A spider with its soft and defenceless body and with breathing apparatus only suited for a land animal, yet living beneath the rough sea and having for its surroundings the wild breakers and the tumult of waters. I carefully secured this specimen, and on reaching my home placed it in a marine aquarium for observation and study. The result of my observations can be very briefly stated. I soon found that this spider could not swim or even walk upon the water, as some other spiders can, that it could not dive, and was indeed quite helpless when placed on the surface of the water. I have since experimented with several specimens I subsequently obtained, and in every case I met with the same results. Though these spiders are so helpless when cast upon water, yet they make their homes under the sea, and where the breakers dash upon the rocks and foam and hiss in their strength and fury. They cannot, however, live under the sea for an indefinite period; they must have access to the fresh air at stated times, and these times are afforded at low tide. At high tide their retreats are completely submerged. When a spider has found a space large enough for a home in the mass of tubes made by the sea-worms it spins a lining of silk all over the walls of its marine dwelling. The rough cave is soon converted into a silk-lined dwelling of exquisite delicacy; one little opening is left. The structure is filled with air and the fineness of the silk weaving prevents the air from escaping. When the tide rises and the rocks are submerged the water cannot enter the spider's cave, because it is filled with air that cannot be driven out by the rising tide. The waves cannot damage the frail retreat because it is safely sheltered deep down in the midst of the rock structures of the sea-worms. In this submerged cave the spider finds a safe retreat during high tide. At low tide it comes forth to hunt upon the rock for small crustaceans and other game. So this is how it comes to pass that a delicately-constructed air-breathing spider is able to live beneath the

wild waves which often thunder upon the rocks on which the tube masses have been built, and to live among those fierce surroundings in a home so delicately made that a careless touch of the collector's finger would at once destroy it. We have also now explained how these spiders, though unable to swim or navigate themselves under or on the water, are able to hold their own against the raging of the sea and find rest and shelter beneath the destroying waves. In considering these facts the student will find scope for reflection in the manifold and wonderful way in which the spirit which moves and works in nature seems to inspire even lowly organisms with a skill and wisdom which, if we think about it, must fill us with adoring wonder.

The next spider I am to introduce to you is chiefly remarkable for the fact that it is an expert angler, and feeds upon fish. I am unable to give you its name, and the observations I have made are, I believe, quite unique. I have not met with any record of similar habits in any spider known to science. For the present I have placed these particular spiders in the family Pisauridae and in the genus Dolomedes. They are spiders of considerable size, with long and powerful legs. The ground colour is deep brown, with two longitudinal yellowish stripes, both on cephalothorax and abdomen. It is found in marshy places and on the fringe of shallow pools of fresh water. It appears to be a rare spider. I have only met with four specimens, though I have sought for them very frequently.

I will now relate to you my first capture and subsequent observations. In the year 1905 I was living in Greytown, Natal. One day I was catching small fish and aquatic insects for an aquarium. I was using a small net in a shallow stream. I happened to see on the edge of the water a fine spider, which I captured. On reaching home I placed my specimen in a large aquarium where I had a number of small fish. The spider measured about 3 inches when its legs were extended; the body is small but the legs are long. After being on the rockwork of the aquarium for some time it took up a very interesting position. It rested two legs on a stone, the other six rested on the water, well spread out, the ends of the six legs commanding a definite and well-defined area of water. Being busy I merely took a note of its attitude and left it to its devices. After a few minutes my servant boy came into my study to say that the spider I had put into the aquarium was eating one of my pet fish. I at once went to see what had happened, and soon saw the spider on top of the rockwork holding in its grip a beautiful little fish about four times the weight of its captor. For a moment I was startled into a strange surprise. How could this spider, which has no power to swim, catch a lively, quick swimming fish. I looked at it in wonder as it seemed to clutch the fish as a cat clutches a mouse. It soon began to devour its catch and after some time had passed nothing was left of the fish but its backbone. The spider had eaten it as surely as an otter eats its trout. I was now anxious to find out how the spider caught the fish. That night, about 11 o'clock, when I had finished my day's work, I sat down by the aquarium to watch the spider with the hope that I might see how the fisherman caught his fish. The spider had taken up a position on a piece of stone, where the water was not deep, and had thrown out its long legs over the water, upon which their extremities rested, making little depressions on the surface, but not breaking the "water skin". The tarsi of two posterior legs firmly held on to a piece of rock just above water level, the whole of the

body was well over the water, the head being in about the centre of the cordon of legs and very near to the surface of the water. After watching for some little time I saw a small fish swim towards the stone and pass under the outstretched legs of the spider. The spider made a swift and sudden plunge. Its long legs, head, and body went entirely under the water, the legs were thrown round the fish with wonderful rapidity, and in a moment the powerful fangs were piercing the body of the fish. The spider at once brought its catch to the rocks and began without delay to eat it. Slowly but surely the fish began to disappear, and after the lapse of some time the repast was over. The spider now commenced to very carefully cleanse its mouth organs from the pollution of the feast. As it was now midnight I left the spider to enjoy its brush up and I went to bed to meditate on the strange sight I had witnessed.

Since my first observations I have been able to repeat several times experiments with other specimens and the same plan for capturing the fish is followed. I have only found specimens at Greytown and Dalton, but I have no doubt they are to be found in many places where there are shallow pools of water, though I do not think they are by any means plentiful.

Common Household Remedies for Poultry.

By Arthur Little, Lecturer on Poultry-keeping, Grootfontein Agricultural College, Middelburg (Cape).

On reading Mr. Dale's article in the April number of this journal, it occurred to me that a similar one would be of interest and benefit to poultry-keepers. The drug store necessary for poultry ailments need be neither an extensive nor an expensive one; in fact it can practically be confined to those drugs and substances to be found in any household or on any farm; the most common of these are the following:—

Bicarbonate of Soda is useful in the treatment of sour crop, sometimes known as enlarged crop, as an aid to digestion, and in poisoning by some vegetable acids, e.g. tannic acid poisoning with acorns or oak leaves.

The ordinary blue bag can be brought into use as a remedy for a very common disease in this country, viz., warts, and will prove very efficacious. The procedure is to scarify the wart and rub some of the contents of the blue bag (sulphate of copper) upon it; three or four daily applications will suffice to effect a cure.

Cart grease.—This, mixed with powdered lime, and applied in the same manner as the above to warts, is also an excellent remedy.

Epsom salts.—One of the poultry-keeper's most useful and valuable drugs, it is decidedly the best laxative we have for poultry. Castor oil, by the way, which is frequently given, is a dangerous drug to use for poultry, for although in a few cases it has no detrimental effect on the majority of fowls, it is almost a poison. Should a fowl look out of sorts or disinclined for its food, give it at once one teaspoonful of epsom salts dissolved in a little warm water; this often prevents a serious illness, and causes the bird to recover its normal condition. Every bird should be given the same dose regularly once every three weeks in the winter and once every ten days in the summer. The best method of administering it is by mixing a sufficient quantity for all in the mash feed. Epsom salts is also useful as a remedy for soft-shelled eggs and those with small clots of blood in them; a quarter of a teaspoonful also dissolved in two tablespoonfuls of water with a small quantity of permanganate of potash (just enough to give a slightly pink colour to the solution) is often of great value in the early stages of enteritis or fowl sickness.

Jeyes' fluid.—A solution of this (one tablespoonful to two gallons of water) should be used for spraying the houses once every fortnight. It is also useful as a dip for these birds infested with lice. Other disinfectants, such as Cooper's or Little's dips, well diluted, are also valuable for the same purpose.

Lard is the cheapest and best medium for the preparation of ointments, for instance, for scaly leg. Heat 1 lb. of lard till quite

liquid; to this add two tablespoonfuls of Jeyes' fluid, and stir occasionally till quite cold and set. After scrubbing the legs with warm water and soap, rub the ointment well in once a day for three or four days. The same complaint may also be cured by applying a mixture of ½ lb. of lard and one tablespoonful of flowers of sulphur.

Lime.—In addition to its use mixed with cart grease, as mentioned above, this substance is very valuable as a disinfectant for tainted runs. The quicklime should be used, spread thickly over the ground, and then dug well in and the run allowed to remain empty for several weeks. Powdered slakėd lime is also useful as a dusting powder, or mixed with the earth on the spots on which the birds have their natural dust baths. It is an excellent insecticide, and can be used with advantage either in the nest boxes or in nests for setting hens. Very little suffices to keep them free from insects, but care should always be taken that it is well slaked and well powdered.

Oils.—Linseed oil is an excellent remedy in cases of acid poisoning. Sweet oil and salad oil are also useful in these cases; both, too, have a slight laxative effect. In crop binding, two teaspoonfuls of either poured into the crop, and the latter kneaded between the fingers, will often effect a cure; injected into the vent they will usually help an egg-bound hen to pass her egg without trouble. A few drops of either, too, administered three times a day to a bird suffering from catarrh will cure it.

Paraffin oil is useful only as a dip for birds infested with sand fleas, and for the purpose of spraying and rubbing over the perches. I do not recommend it internally, as it has a somewhat irritant effect.

Onions.—These also are excellent as a cure for catarrh; also as a tonic. Further, a small quantity fed now and then to the birds in cold, wet weather, is a good preventive of colds. For young chickens they are invaluable to tone up the system and quicken growth.

A rusty iron nail placed in the drinking water acts as an excellent tonic; it is an old-fashioned method of supplying iron to the system, but a very good one.

Common Salt.—A pinch of this should always be added to the soft food. It is a good corrective, and aids digestion.

Flowers of Sulphur.—As mentioned above, in conjunction with lard, this makes a good ointment for scaly leg, also for the destruction of lice. In hot weather, mixed with the soft food (one-quarter of a teaspoonful to each bird once a week), it acts as a good blood purifier, but it should never be given in cold weather. It is excellent also during the moulting period to promote the growth of feathers. In the form of an ointment, too, it is a good remedy for warts, simple skin diseases, and feather plucking.

Tea (cold).—Bathing the vent with this after the application of hot water is very beneficial in cases of protrusion of the vent.

Glycerine.—Six drops of this three times a day will usually cure catarrh and mild cases of bronchitis.

Turpentine.—Twelve drops in one teaspoonful of sweet oil an hour before the morning feed, and last thing at night, for four or five days, will usually cure the most obstinate case of worms in a week; for chicks of from three to six months old give eight or nine drops.

Vinegar.—This applied hot to warts is also an excellent remedy in conjunction with a good dose of flowers of sulphur; the warts should be bathed three times a day.

Washing soda.—In cases of rheumatism, with loss of power in the legs, dissolve a small handful of this in hot water and hold the bird's legs up to the hock joints in it for a few minutes, then rub some embrocation into the joints, and the bird will quickly recover.

The Design and Construction of Piggeries.

By W. S. H. Cleghorne, B.Sc., A.M.I.Mech.E., Lecturer in Engineering, School of Agriculture, Potchefstroom.

Increasing attention is being given to the rearing of pigs, especially in connection with the dairy industry. Many inquiries have of late been received for information as to the building of piggeries, and this article has been written in the hope that it will supply the required information.

Requirements for a Good Piggery.

The principal requirements to be kept in view when designing a piggery are:—Light, ventilation, dry floors, cleanliness, and avoidance of extremes of temperature. The covered pens, food preparation room, and passage should preferably be all under one roof, in order to economize labour.

Light.—Animals thrive all the better when they have plenty of sunlight. Good lighting is desirable, even though it be only to show up dirt more clearly. In designs 1 and 2 (*vide* Figs. 1 and 2) the general lighting of the pens and passages will be good, without windows, but the provision of one or two windows in the passage wall in design 1, and in the side walls in design 2, would probably be advantageous. They should be capable of being opened wholly or partially in order to supplement the ventilation in hot weather. A window hinged along its lower edge and opening inwards tends to deflect the cold incoming air upwards.

Ventilation.—In design 1 ventilation is provided for by leaving openings along the eaves, i.e. openings between the tops of the side walls and the corrugated iron of the roof.

In design 2 the eaves are similarly open, and in addition the roof is open right along the ridge, this opening being protected by a raised ridge cap of curved form.

Dry Floors.—The difference between dry and wet floors is the difference between healthy and sickly pigs. In addition to being formed of materials impervious to moisture, the floor should be well and truly laid so that water, etc., cannot collect in pools. The floor should have a good slope towards the sewage outlets. A floor made of permeable materials such, for example, as an earthen floor, or one of wooden spars, becomes soaked with urine and more or less insanitary and damp. This may contribute towards causing the pigs to suffer from rheumatism and parasitic diseases, such as worms. It must be remembered that the conditions of pig-life in a pen are not akin to those obtaining in open paddocks.

Cleanliness.—Pigs repay the trouble expended in keeping their styes clean. Further, pigs will second efforts to keep them clean by themselves developing cleanly habits.

No feeding-troughs should be tolerated in the sleeping pens; they should be confined to the yards. The interior of the whole building should be limewashed at least twice a year, and the pens should at frequent intervals be washed out with Jeyes' fluid or a suitable dip to keep fleas, lice, etc., under control.

Avoidance of extremes of temperature.—This depends largely on the materials of construction employed. A good building from this point of view would be one with walls of brick or stone, and a thatched roof, though a roof of this description somewhat increases risk of fire, and may harbour insects. Galvanized iron is a bad heat insulator, being too hot in summer and too cold in winter. If a galvanized iron roof be used, it should not be placed too low, as a low iron roof exaggerates the effects of extremes of temperature.

SPACE REQUIRED.

A space of from 80 to 100 square feet should be allowed in a covered pen for a sow and litter, or for about six young pigs. The open yard in connection with the pen should be about half as large again. In the designs given (1 and 2) the pens with the large open yards at the food-room end of the buildings may be used for a larger number of fattening pigs.

THE SITE.

A naturally dry, slightly sloping site should preferably be chosen for the piggery.

THE WALLS.

The walls should be built preferably of brick or stone; corrugated iron is too hot in summer and too cold in winter. In design No. 1 the walls are 9 inch, and in design No. 2, 9-inch and 14-inch brick walls. If of stone, the principal walls may be made 18 inches thick, and the partition walls 15 inches thick. They may, for the sake of cheapness, be built of sun-dried bricks, in which case they had better be a brick and a half, or 14 inches thick, and should be protected on their inside surfaces from the grubbing habits of the pigs. This protection may be secured by building in two horizontal wooden wall-plates 4½ inches by 3 inches in cross section, to which are nailed corrugated iron sheets reaching to at least 3 feet above the floor. Walls made of sun-dried bricks may be protected from rain and damp by a coat of tar applied cold. The tar will probably blister in some places. Such blisters should be scraped off and the places carefully re-tarred.

The partition walls forming the sleeping pens and exercise yards should be from 3 feet 6 inches to 4 feet in height.

Partition and yard walls strongly and stiffly built of wood and corrugated iron are fairly satisfactory. The posts below ground should be charred, and they should be tarred all over, so as to increase their resistance to rot.

If they can be procured cheaply, old railway sleepers placed vertically with their ends in the ground make good partition walls, or they may be made of rough timber when it is cheaply procurable.

FOUNDATIONS.

The foundations in the designs given are of masonry, of an average depth in design No. 1 of 12 inches, and in design No. 2 of

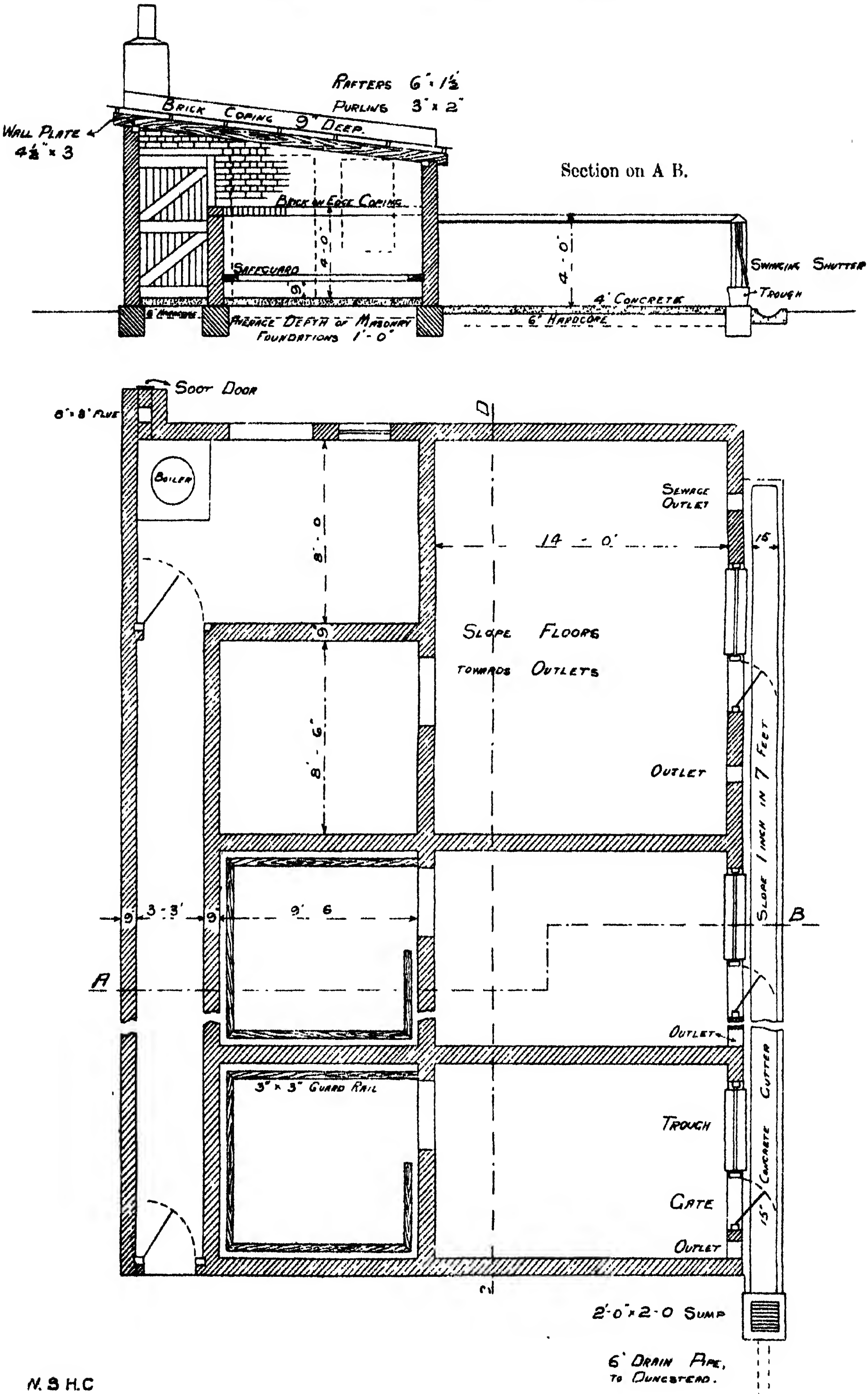


Fig. 1 (*a*). Design No. 1.

18 inches, below the surface of the ground. The stones required will probably in most cases be procurable on the farm; they should be of large size; cement mortar should be used for the foundations in preference to lime mortar. The stones should be laid on their natural beds with large headers at frequent intervals. The foundations should be topped by a damp-proof course, consisting of a layer of hot tar mixed with pitch and sand, or of hot asphalt, or sheet asphalt.

THE ROOF.

The roofs shown in designs No. 1 and No. 2 are of corrugated iron. The lean-to form shown in design No. 1 is cheap and quite satisfactory; for this roof, four rafters 6 inches by 1½ inches can be cut from a 12-inch by 3-inch deal, or four rafters 4½ inches by 1½ inches in cross-section could be cut from a 9-inch by 3-inch deal, giving a roof not quite so strong as in the first case.

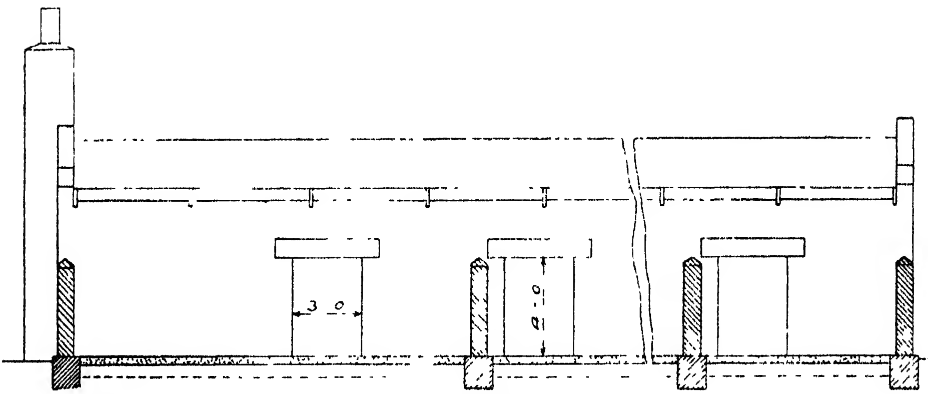


Fig. 1 (b). Section on C D. Design No. 1.

The 2-inch by 3-inch purlins should be nailed to the rafters on edge, i.e. with the 2-inch dimension next the rafter. This will make a stronger roof than nailing them with the 3-inch dimension parallel to the rafter.

A thatched roof made from grass or reeds is suitable, and maintains a more even temperature than does corrugated iron.

THE FLOOR.

The floor is a most important part of the building. It should be hard to prevent the pigs from rooting it up, well laid so that water, etc., will not collect in pools, impermeable to moisture, and non-slippery.

Probably the best floor is one of hard burned bricks laid in cement mortar on a 3-inch layer of concrete, which in turn rests on a 6-inch layer of hard core, i.e. broken bricks or stone.

A cheaper but satisfactory floor consists of a 4-inch layer of concrete resting on 6 inches of hard core, the concrete consisting of one part by bulk when dry of cement, three parts clean sharp sand, and five parts of broken stone or shingle. Before the concrete is quite set, it may be floated over with one part of cement to three parts of clean sharp sand, which is brushed over with a coarse brush before setting to render the floor less slippery.

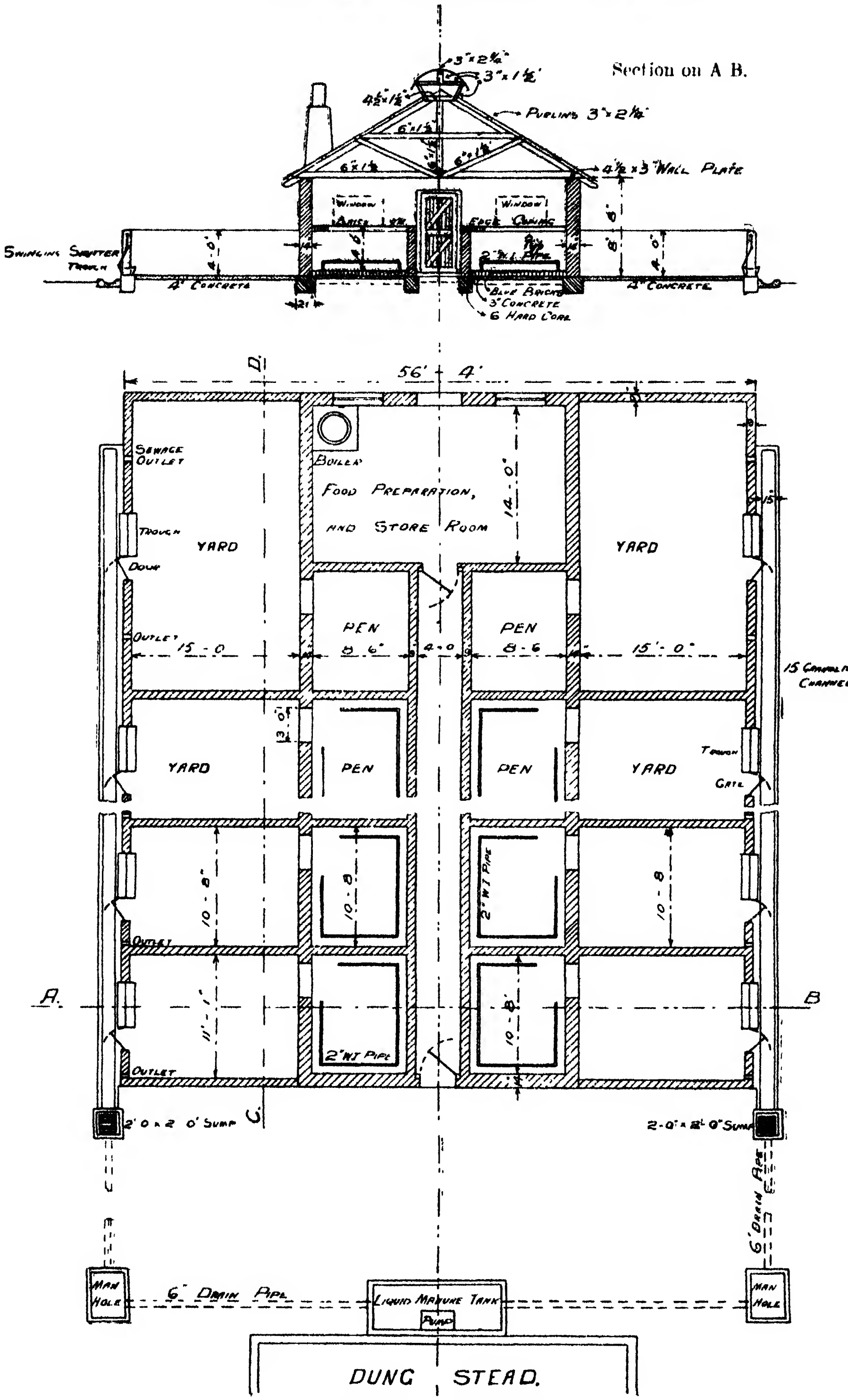


Fig. 2 (a). Design No. 2.

The floor will be most liable to crack at the corners, and should be carefully laid and made a little thicker there. The floor in the pen should be at least 2 inches higher than that in the yard, with a step down to the latter so as to insure a dry sleeping place.

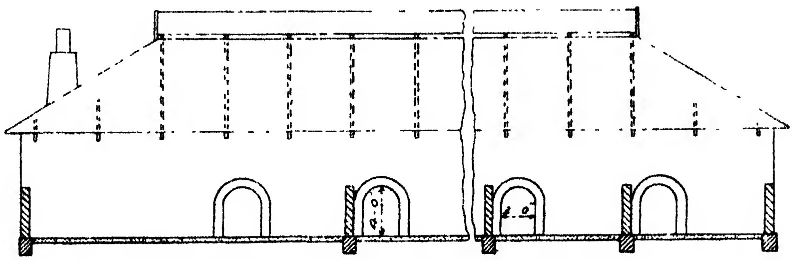


Fig. 2 (b). Section on C D, Design No 2.

The pen floor should have a slope of about 1 inch in the yard towards the doorway between pen and yard, and the yard should have a similar slope towards the sewage outlets leading to the gutter which runs along the front of the yards.

On farms where flag stones are obtainable these will probably form the most economical floor. They should be well laid in cement. If laid without cement, urine and water percolate between the flags and soon render the earth below foul and soft, so that it oozes up between the flags under the weight of the pigs and is no longer able to maintain the flags level.

A floor of beaten earth is sometimes used, though it is not recommended except as a temporary expedient; such a floor should be thoroughly drained. The drainage may be effected by a trench drain, consisting of a trench 3 feet deep, filled with stones, passing below the middle of the yards from end to end of the piggery, and leading to the liquid manure tank.

A raised platform of open wooden spars is sometimes recommended to be placed in the pen to form a warm sleeping place, no bedding being then required. If this be used, it should be removable for cleaning purposes.

DRAINAGE OF LIQUID MANURE TANK.

The sewage outlets from the yards should discharge into a concrete or granolithic gutter having a slope of not less than 1 inch in 7 feet. This gutter discharges through a grating at its lower end into a manhole formed in concrete, from which a drain-pipe leads to the liquid manure tank (*vide* designs Nos. 1 and 2). This drain-pipe should be as straight as possible, and should be provided with a man-hole at each bend about 18 inches deeper than the centre line of the pipe. The slope of the drain pipe should not be less than 1 inch in 2 feet, and it should be steeper if the slope of the ground permits.

BOILER-HOUSE OR FOOD-PREPARATION ROOM.

Especially in the rearing and fattening of pigs, boiled food or food soaked in hot water is generally regarded as advantageous. At one end of the piggery there should therefore be provided a boiler-house and food-preparation room combined.

A boiler of about 80 gallons capacity will be found generally suitable for a moderate-sized piggery. In design No. 1 the chimney is built outside the building for the sake of simplicity in construction.

A good arrangement, and one which economizes labour, is—in cases where the piggery can be erected at a lower elevation than the dairy—to run a $1\frac{1}{2}$-inch to 2-inch pipe from the dairy to a tank in the food-preparation room for the purpose of conveying by gravitation the skim milk, whey, and any waste milk from the dairy to the piggery.

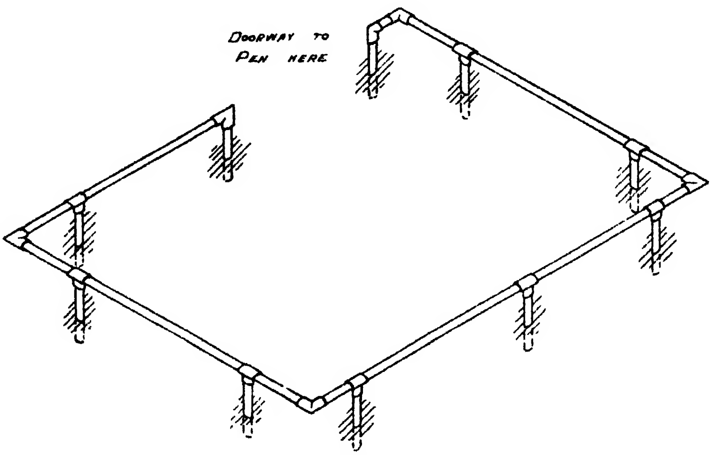


Fig. 3. Farrow Safe guards of $1\frac{1}{2}$ inch piping.

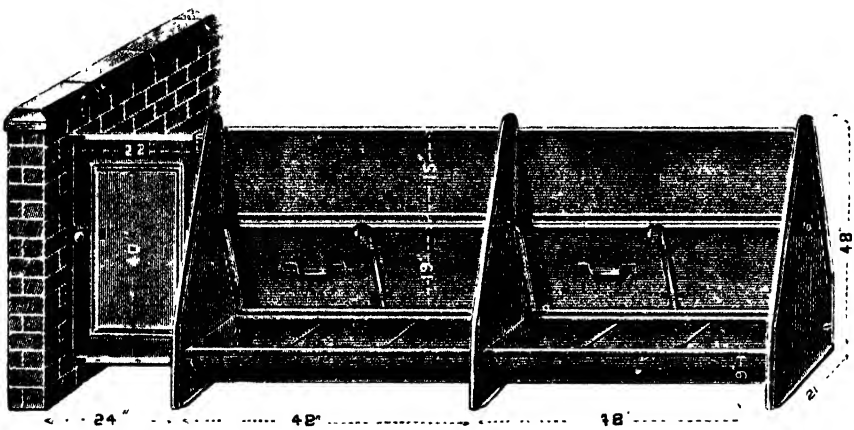


Fig. 4. Price at Coast about £9. 12s. (with two troughs).
" " about £5. 8s. (with only one trough).

FARROW GUARDS OR SAFE GUARDS.

These are for the purpose of protecting the young pigs from being overlaid by the sow. In design No. 2 they consist of a horizontal rail with vertical supports at intervals, both rail and supports being made of $1\frac{1}{2}$-inch gas-piping, the supports being joined to the rail by T-pieces and the corners being formed by elbows—$1\frac{1}{2}$-inch gas-piping costs

about 7d. per foot f.o.r. Johannesburg. The lower ends of the supports are built into the floor, as shown in fig. 3.

In design No. 1 the guards consist of 3-inch by 3-inch hardwood rails, supported at intervals by wooden blocks.

The guard rail should be 9 inches clear of the floor, and the distance from the wall to the guard rail should be 9 inches.

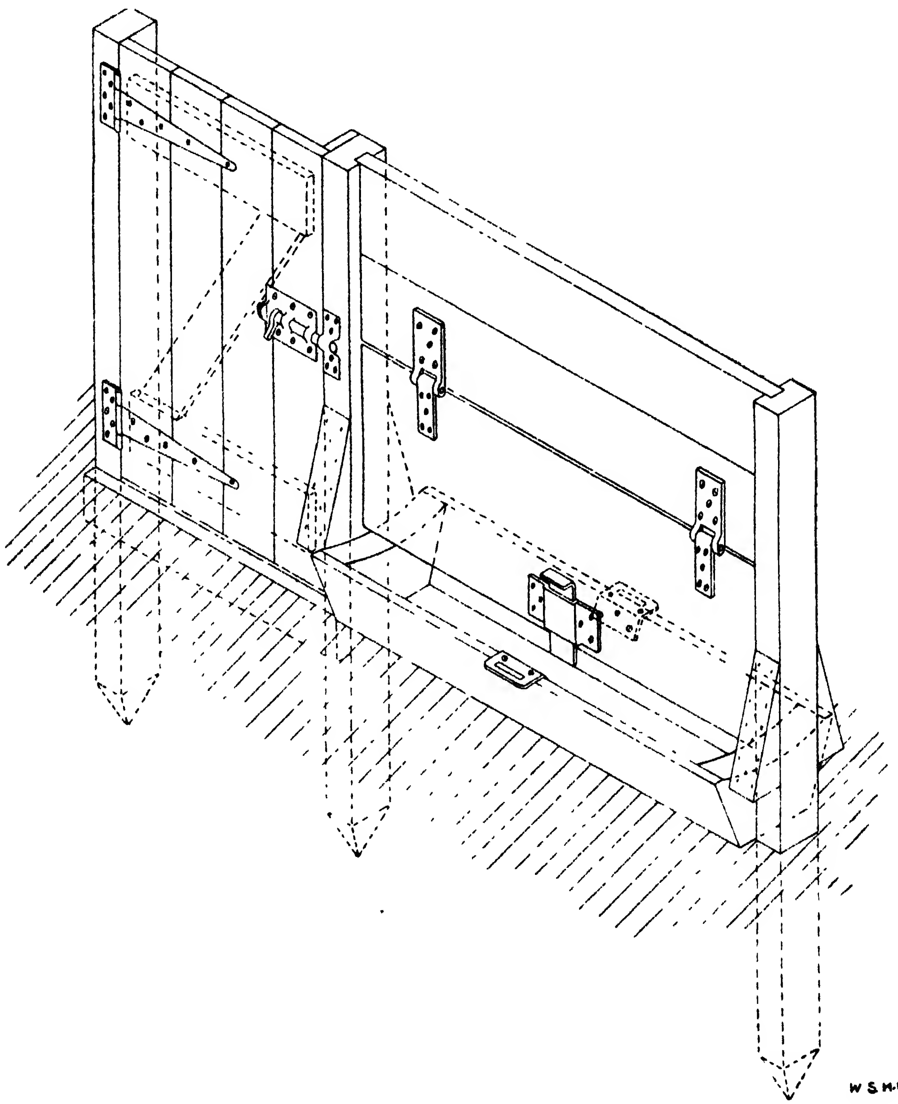


Fig. 5.

TROUGHS, DOORS, ETC.

These can be bought in iron, as shown in Fig. 4. The same style of trough and gate can be made in wood, as illustrated by Fig. 5. Three 4½-inch by 3-inch posts are sunk 2 feet into the ground to form the gate posts, etc., the ends having first been charred and tarred to

fortify the wood against rot. The trough has the usual hinged flap above it, so that it can be opened either to the pigs for feeding or to the attendant for cleaning purposes. It should be raised slightly above the level of the floor and may be lined with galvanized sheet iron or zinc to prevent rotting. The trough may be soaked thoroughly in petroleum to prevent the pigs chewing the wood. Everything must be very strong, and hard wood is to be preferred, at least for the vertical posts. The construction will be clear from the figure.

A second trough should be provided inside the yard for drinking purposes, so constructed as not to be easily upset. Good troughs of reinforced concrete manufactured in this country can be obtained—for example, from Messrs. Wright & Sons, Zuurfontein.

COST.

For reasons of cost, design No. 1 would be more likely to be adopted than design No. 2.

A piggery to design No. 1 would cost about £160 in the Transvaal and £120 at the coast. These prices are for four pens and yards, i.e. one more than shown in fig. 1. The cost may be lessened by constructing the piggery as a lean-to to another building, care being taken to leave an opening for ventilation along the upper edge of the roof. If materials of construction, such as good clean sand for concrete and flag stones for the floor, are obtainable near the site the cost may be still further reduced.

Arsenic in Milk.

REPORT ON ALLEGED EFFECTS OF DIPPING.

The following report on the alleged injurious effects of arsenical dipping upon milk has been submitted by the Government Analyst, Johannesburg, to the Secretary for the Interior:—

"Through the courtesy of Colonel H. Watkins-Pitchford, of Pietermaritzburg, I obtained five samples of milk from the farm of the Honourable J. Baynes at Nels Rust. The cattle on this farm have been habituated to an arsenical dip for many years and are now dipped weekly.

"Through the favour of Dr. Murison, of Durban, I obtained four samples of milk from cows which are regularly washed with arsenical solutions and two samples from cows which are dipped weekly in an arsenical bath.

"In addition to these samples a chance sample of milk purchased in Johannesburg was also examined.

"By the Reinsch process, which is capable of detecting 0.0001 grain of arsenic, no indication of the presence of this element could be obtained when working on 100 cubic centimetres.

"The samples were all examined by the official Marsh test. Absolutely no arsenic was found in two samples from Nels Rust and none in three samples from Durban. In three samples from Nels Rust and in three samples from Durban, traces of arsenic were found to be present. A trace of arsenic was also found in the chance sample of milk purchased in Johannesburg. In those cases where arsenic was found to be present, the amount was too small for accurate estimation of the quantity.

"By the failure of the Reinsch test to show the presence of arsenic, it is indicated that the amount present is less than 0.0045 grain per gallon; the amount of arsenic as estimated by the Marsh process was found to be less than this quantity, but the results do not permit of the specification of an exact figure. I am of opinion that it may safely be asserted that in none of the samples examined was there more than 0.0045 grain of arsenious oxide present in a gallon of the milk; in nearly half of the samples examined no arsenic was found and in the other cases the amount present was a maximum of 0.0045 grain per gallon or 0.00027 grain per half-pint (and the actual amount present was probably much less).

"The official dose of arsenic is from 0.0166 to 0.066 grain; therefore, at the maximum, half a pint of the arsenical milk would contain only 1-60th of the minimum official dose.

"The smallest fatal dose of arsenic (arsenious oxide) reported is 2 grains; as the maximum amount of arsenic found in milk from

dipped cattle is only 0.045 grain per gallon, a fatal dose would only be contained in 444 gallons.

"The fact that some of the samples are free from arsenic indicates that arsenic is not absorbed by the animal and secreted in the milk, and the traces of arsenic present are probably due to accidental contamination possibly during the process of milking.

"I am of opinion that the quantity of arsenic present in milk derived from dipped cows, as revealed by the above tests, is harmless. As a matter of fact, it was found that distilled water free from arsenic after standing in a new washed glass bottle for fourteen days had absorbed from the glass such a quantity of arsenic as to make a solution of approximately the same strength (as shown by the Marsh test) as that sample of milk in which the largest amount of arsenic was found. The danger would appear therefore to be as great by keeping milk in glass bottles as in dipping the cows in an arsenical solution, and both dangers are, in my opinion, negligible.

"(Signed) I. McCRAE, Government Analyst."

Molasses or Treacle for Stock Feeding.

RAILWAY FACILITIES FOR SUPPLIES.

MUCH has been written about the feeding value of molasses or treacle for stock, and that its value as such has often been exaggerated there is little doubt. At the same time, however, it has been demonstrated that a little molasses in the feed is quite beneficial, acting both as a tonic and (in the case of cows) as a stimulant to greater and richer milk production. In the United States there is, perhaps, no stock-feeding material that has aroused so much general interest amongst stock owners and feeders as Louisiana low-grade molasses (or "blackstrap," as it is otherwise known). The custom of feeding molasses to the working stock on the large sugar estates of Louisiana has been adopted, in anything like systematic manner, only within the past few years. Previously, and when the price was extremely low, quantities of the material were run into large iron troughs, and the mules allowed free access to it; and, to some extent, this rather prodigal method still prevails. The true value of blackstrap as a food stuff has become more apparent of late years, however, and as the question of feeding economically has become one of considerable importance, it is being used more as an ingredient of the "balanced ration," and, as a rule, mixed with other concentrates.

The chief value of molasses as a food is its economic source of carbohydrates (sugar), some idea of which may be had from the following (taken from a bulletin issued by the Louisiana Experiment Station):—

	Diffusion Molasses.	*Mill Molasses.*
Carbohydrates (sugars)..........	67·07	65·90

From this it may be seen how rich this hitherto-considered waste material is in the carbohydrate nutrient, and when it is known that these sugars are almost, if not completely, digestible, its enhanced value may still further be appreciated.

RAILWAY FACILITIES FOR NATAL MOLASSES.

In connection with this subject it is interesting to note that the Department of Commerce and Industries is calling the attention of the various farmers' associations throughout the country to certain arrangements which have recently been concluded with the Railway Department for enabling agriculturists throughout the Union to obtain molasses from the sugar-growing districts of Natal at a specially low rate.

The Railway Department has now agreed to carry molasses from any sugar factory in full tank truck loads of 3000 gallons at the following rates :—

	Miles.	£
For	50	6
„	100	8
„	150	10
„	200	12
„	250	14
„	300	16
„	350	18
„	400	20
„	450	22
„	500	23
„	550–600	24
„	650–700	25
„	700–800	25
„	850–1000	26

It will be observed that to the furthest distant point mentioned in the above table, the railway charges amount to a little over 2d. per gallon, and as the sugar growers have agreed to sell the treacle, *ex* factory, at 1d. per gallon, this will admit of its being obtained at destination at very slightly more than 3d. per gallon. To points nearer the place of production the rate will enable the treacle to be disposed of at considerably below 3d. per gallon, which is more than 50 per cent. less than the average cost of the same weight of mealies. It may be added that a gallon of treacle weighs 14 lb.

The idea suggests itself that groups of farmers living within reach of railway stations might combine for the purpose of availing themselves of these reduced rates. Tanks of 400 gallons capacity can be purchased from the sugar estates at about £3. 10s. each, and from 10 to 12 of these would be required to take a full truck load of 3000 gallons, at the same time allowing for certain reserve space. It is suggested, therefore, that each group of farmers, by means of these tanks, should make provision at the stations for storing the treacle, which could then be drawn off by gravitation into small tanks on the wagons or carts used for the delivery of cream or milk.

In conclusion, it is suggested that inquiries as regards supplies of molasses should be addressed to the Secretary of the Natal Sugar Growers' Association, Durban.

Notes.

A Short Course in Agriculture, etc.

The attention of those interested is called to the notice which appears in the present issue notifying that a short course of instruction upon agriculture and live stock, veterinary science, agricultural engineering, dairying, poultry, horticulture, agricultural botany, agricultural chemistry, agricultural zoology and entomology, will be given at the School of Agriculture at Potchefstroom shortly. The course will begin on the 10th August and end on the 8th October, and full particulars are obtainable on application to the Principal.

Prize Essays on Irrigation.

The South African Irrigation Association is announcing a most interesting competition. Apparently with the object of discovering and encouraging local talent it is offering a prize of £15 for the best essay to be compiled under the following heading: "The Distribution of Water." The essay has to show the most effective methods of distributing water over land for the profitable production of crops under irrigation, and to have regard to (*a*) the character of the water supply; (*b*) the character of the soil to be irrigated; and (*c*) the surface conditions and slope of the land. These details should be sufficiently explicit to guide any one of experience in the compilation of an essay of this description, and considering the scope of the subject we may anticipate some exceedingly valuable papers, only provided that the right people enter the competition. The prize essay, and possibly some of the best of the others, are, we understand, to be submitted to the annual congress which will meet in the second week in October at Oudtshoorn.

The conditions attached to the competition, which is open to residents within the Union of South Africa only, are that each must be clearly written, or typed for preference, in either English or Dutch, and no essay must contain more than three thousand words. All the essays submitted are to become the property of the Association, with rights of publication. Competitors are also instructed to sign their essays with an assumed name, and to enclose their own names and addresses in sealed envelopes with the assumed name written distinctly outside. The object of this is to give the judges an opportunity of deciding the value of the essays each on its own merits. All essays must be in the hands of the Secretary of the Association, Mr. F. D. MacDermott, Department of Agriculture, Box 434, Pretoria, not later than 15th July next. This will not give too much time for judging, so none will be considered which may be received after that date.

Cradock Field Trials—1913.

With reference to the note in the March issue, in which it was announced that the Cradock Agricultural Society has decided to offer at its 1913 show prizes to the value of £25 for a plough suitable for making small furrows such as are necessary in wheat lands for irrigation purposes, we have now received fuller information respecting the competition, details of which will doubtless prove of interest to many readers. The sum of £25 offered will be distributed in two prizes of £12. 10s. One of these is for a light plough suitable for making furrows in wheat lands which have already been ploughed to a depth of 8 inches. This implement must have double mouldboards, reaching down to the level of the under-side of the sole plate, and capable of cleaning out all the loosened ground to the full depth of the same, so as to form a furrow about 6 inches broad at the bottom, with sides sloping at angles of forty-five degrees. The mouldboards, at the beam and along their full length, must be hanging over very much forward so as to prevent ground passing over them and to make it roll forward, as it were, as it slips back along them. They must be somewhat longer than is necessary to form the furrow of the above shape, so that they will also compress the sides, and thus make them better able to resist the tendency of the water to burst through them. Should the spread of the mouldboards be variable so as to make a little larger furrow if desired it will be considered an advantage, provided that they still clean down to the same depth.

The other prize is offered for a heavier and stronger plough, such as is in general use in South Africa for ploughing heavy soils for the first time. It must be suitable in every way for this purpose, and so arranged that it can easily and quickly be altered to throw out ground which has already been ploughed to a depth of 8 inches, so as to form a furrow about 18 inches broad at the bottom, with sides sloping at angles of forty-five degrees. It is suggested that the double mouldboards, which it is presumed will be used for the purpose, should be bolted to the shin piece, and the latter, if strongly made, can be amply secured to the beam by two bolts, so that very little time will be taken in disconnecting the single right-handed mouldboard, etc., and connecting the double one. These can be of thin steel, but must overhang forward very much, near the beam and along their full length, so as to prevent ground passing over them and to make it roll forwards, as it were, as it slips back along them. They must be longer than is necessary to form the furrow of the above size and shape, so that they will also compress the sides, and thus make them better able to resist the tendency of the water to burst through them. The Society hopes that the makers of the various "braaking" ploughs will so modify the design that in future consignments sent out here it will be possible to buy them either for first ploughings only or, by paying a little extra, to get the double mouldboard attachment also; thus these ploughs will be then suitable for "braaking" ground and also for furrow-making for watering previous to the general ploughing and for distributing water to the veld from valleys, etc., where it now runs to waste and does great damage by cutting dangerous channels.

The trial will take place near Cradock a few days previous to the show, which will probably be held early in March. The judging

will be by points, and the prize money paid out will be in proportion to the points awarded to each winning implement. Entries have to reach the Secretary of the Society by the 1st February, 1913.

Middelburg (Cape) Field Trials—1912.

The following is the judges' report on the 1912 field trials held at Middelburg (Cape) in connection with the agricultural show:—Your judges, after an exhaustive trial, which proved both interesting and instructive, have decided to withhold the £100 prize on the grounds that no implement in their opinion is of first-class merit. In view of several implements being considered useful and likely to be improved upon in the near future, and especially adapted to our requirements, we have decided to encourage development by awarding special prizes. For this purpose we have divided the implements into wheeled scoops and graders. A special prize of £25 to York's Wheel Scoop; special prizes of £10 each to Messrs. Stirk's "Glide" Grader and Messrs. H. B. Cuming & Co.'s "Cuming" Grader.

York's Scoop (£16. 10s.): The principle of a revolving bowl employed in this scoop is undoubtedly the best; the implement is an improvement on the old wheeled scoops, and saves time, but levers used in working are cumbersome. Roberts Scoop (£10 each), shown coupled together: This scraper we consider ingenious as regards the balancing when loaded, also the tipping back for refilling. Haarhoff's Scoop (£16): Ingenious, but incomplete; we hope the exhibitor will succeed in improving it. Stirk's "Glide" Grader (£22. 10s.): A very useful, well designed, easily handled implement; rather small in the blade for our requirements. Stirk's "Senior Panama" Grader (£27. 10s.): Strongly built and serviceable; easy, but slow in manipulation. H. B. Cuming & Co.'s "Cuming" Grader (£40): Takes a good load, and would do good work if thoroughly understood. but must have more convenient arrangements for reversing the mouldboard; unfortunately, the price is very high. Malcomess (£14); Hofmeyr, Du Toit & Duffet (£11): Both show the same heavy grader, the "Junior Panama." *For exhibition only.*—Malcomess's "Buck Scraper" (£6. 10s.): A useful little drag scraper. York's Banker (£12. 10s.): A really useful implement, well and strongly made, on the revolving principle.

Next Year's Field Trials at Middelburg.

The Agricultural Field Trials Association of Middelburg (Cape) has decided to offer a first prize of £10. 10s. and a second prize of £5. 5s. for level-taking instruments for farmers' use, also a £5. 5s. prize for the best levelling staff for farmers' use. Although the Middelburg Field Trial for 1910 for the £25 prize produced some twenty instruments specially designed for farmers' use in taking levels, none of them was altogether satisfactory. The judges' criticisms and suggestions have, however, resulted in very marked improvements being made in several of them, and since then various new instruments have been put on the market. Consequently, the placing of the instruments in the order of merit at the trial in question can no longer be taken as a safe guide in this matter. It is in order to keep irrigation farmers up to date in this subject that this new trial has been arranged.

Sunday's River Farmers' Association (Natal).

Mr. James Henderson, of Balbrogie, Waschbank, Natal, writes informing us that a farmers' association, to be known as the Sunday's River Farmers' Association, was formed on 20th April last, with Mr. H. B. Cronje, of Mielietuin Hoek, Biggarsberg, as president, and Messrs. J. C. Henderson and Philip Meyer as joint secretaries and treasurers. Meetings are to be held on the last Wednesday of every third month. It is hoped to have between thirty and forty members, and the Association will fill a long felt want, as hitherto the district has been without any farmers' organization.

Report on Wheat from Zak River.

The following report from London on a number of samples of wheat grown at Zak River, Fraserburg District (Cape), by the South African Milling Company has been received:—*No. 1. N.S. Manitoba.*—This is a beautiful sample. It is hardly equal to No. 1 Hard Manitoba, but it is undoubtedly better than No. 1 Northern Spring Manitoba. At the present time it would be worth 42s. 6d. per 480 lbs. c.i.f., London. *Oudebaard.*—This also is a fine wheat. In character it is somewhat like the heavy red Argentine wheats, but there is nothing from South America comparable. It would probably come nearest to a sample of fine English Red Wheat. We should put the present value at about 40s. *From Australian Federation Seed.*—This is a fine, bold, clean wheat. It is undoubtedly better than this year's South Australian. Present value is about 38s. 6d. *Colonial White Wheat.*—This is a weaker description than the preceding and partakes more of the character of Blue Stem. We should value it at about 37s. 6d. *Rye.*—This is also a fine sample. At the time the above was written (the report concludes) we were in receipt of Australian quotations, 37s. c.i.f.

An International Arab Horse Society.

An international horse society is being formed in Cairo for preserving the pure-bred Arab horse, which is so essential for improving and renovating the different breeds of the whole world. The many changes that have taken place and are still taking place in the lives and habits of the Bedouins of the Syrian and Arabian deserts are producing a fatal effect upon the Arab horse, which is gradually decreasing in numbers and deteriorating in quality. Buyers of pure-bred Arab horses, whether they be private individuals or representatives of Government studs, complain of the yearly increasing difficulties in getting first-class Arab horses and of being certain of the purity of their origin. To meet this great demand, the Society intends arranging annual shows and auction sales at which they will be able to offer first-class representatives of the Arab horse for the purity of which they will certify.

The aims of the society are thus set forth: (1) To start a stud book of the Arab horse, containing two sections, the first to include only the pure-bred animal or horse of desert origin; the second to

be open to all Eastern horses, so called. In Europe it is generally supposed that horses bred in Egypt, Syria, Asiatic Turkey, Algiers, etc., are all pure-bred Arab; this, however, is a fallacy, for only a very small percentage of the above-named breeds can claim that distinction, the remainder, which are called "Eastern horses," having all, in a greater or lesser degree, an infusion of various alien breeds. The pure-bred Arab is to be found only (*a*) among the different Bedouin tribes roaming over the Arabian and Syrian deserts and Mesopotamia and in Nejd; (*b*) in a few private studs of Egypt; (*c*) in three or four studs in Europe. (2) To establish annual shows and auction sales at Cairo for pure-bred Arab horses and Eastern horses.

The third object of the society is to encourage Arab horse-breeding in Egypt, the country which is most adapted to that purpose, as it possesses all the essentials necessary to ensure success in rearing the Arab horse, viz., dry desert air and hard dry ground, a hot, even climate, and, practically speaking, no rainfall. All these conditions make it possible to keep both mares and produce all the year round in the open without shelter of any kind, and thus ensure their retaining that hardiness of constitution, those clean strong legs, and wonderfully sound lungs which are the principal characteristics of the Arab horse. Egypt is also most favourably situated as a central rallying point for the Arab horse, being close to the Arabian peninsula and Syrian Desert, and at no great distance from Bombay, Koweit, and Mosul, the two latter towns being the principal markets and export ports of Arab horses to India. The manifesto issued by the society says: "Arab blood is essential for improving and renovating other breeds, but the thoroughbred Arab has neither the height nor the substance necessary for heavy-weight riding horses nor for carriage horses. The best all-round horse for riding, driving, and military purposes is, indubitably, the Anglo-Arab. Arabs crossed with cart horses have given the best results, as, e.g. the Boulonnais, the Percheron, and the Russian Orloff trotter, which latter is the descendant of an Arab stallion and a Danish mare."

To demonstrate at the show the utility of crossing pure-bred Arabs with other breeds, it is purposed to have classes for those breeds which trace back their origin to such crosses or have been periodically recrossed again with Arabs. Such are: (1) the Russian Strelets breed, the Cossack, and Rastopchine horses; (2) the French Anglo-Arabs; and (3) the Hungarian horses. These classes would prove how enduring the Arab blood is when used judicially, for, notwithstanding that in some cases many decades have passed since this crossing was made, the descendants still retain the best characteristics of the Arab horse.

Persian Sheep in Natal.

An inquiry was recently received for information in regard to Persian sheep. The matter was referred to the Principal of the School of Agriculture, Cedara, Natal, who furnished the following reply,

being an extract from the second volume of the *Cedara Memoirs*:—Spring lambs were obtained in September, October, and November from the various breeds included in the flock. Of these the haired Persians, despite their reputation and a considerable period of acclimatization, appeared to have least stamina. Hampshires came next, and Lincolns and Merinos followed in the order named. Pure-bred Woolled Persians were very delicate, but the Woolled Persian cross-breds were most robust and hardy. As a matter of fact, in the following September the only lambs left alive were these cross-breds, all others, with the exception of one Merino and one Lincoln, having succumbed to one or other of the infections indicated above. Three Woolled Persian rams were put with sixty Merino, twenty Lincoln, six Hampshire, two South Devon, and three pure-bred Woolled Persian ewes. Animals of the first three breeds had been recently imported, while the other sheep had been on the farm for two years. A careful examination was made of the cross-bred lambs and their wool, and the following results secured.

The best cross for general utility is the Woolled Persian—South Devon. This cross-bred wool is beautifully white, almost lustrous, and very soft, giving a length of nearly 4 inches. The frames and constitution of the animal are unsurpassed, and early maturity is a marked feature. The demand for these cross-bred ram lambs from farmers who saw them was very keen, and good prices were offered. It is not, however, intended to advocate the use of cross-bred rams for breeding purposes, as such a system cannot be supported by intelligent principles of stock husbandry. The next cross in order of merit was the Woolled Persian—Merino, or, to adopt a recently suggested term, the Persiarino. This type is smaller than the former, but the wool is finer, a shade shorter, and not quite so bright. It is not improbable that this cross may figure largely in South Africa as a general purpose sheep with many good points and no bad ones. The Woolled Persian—Lincoln cross gives a good mutton sheep, the constitution not so robust as in the two former cases, the wool coarse but bright and rather open. A Woolled Persian—Hampshire cross was rather disappointing; the wool is very rough and discoloured, having grey and black hairs throughout the fleece. Possibly the next lambing will give more material upon which a final judgment can be passed.

Referring again to the Persiarino, an interesting account was published in a recent colonial agricultural journal by a sheep breeder of Los Vegas, California, who had tried this cross. He had found it so successful that his present opinion is that the animal will stand extreme cold, and thrive on poor fare; that the mutton is better than anything yet produced, and that the wool is comparatively fine fibred, strong, and lustrous. Two instances have been recorded in Natal where this cross-bred wool realized equal prices with the best Merino wools on offer at the sales in question.

Pernicious Scale Notes.

THE Government has decided that it is inadvisable to resume the measures for the eradication of the pernicious scale, as to continue with them would involve the expenditure of a very large sum of money without any assurance and indeed little hope of complete success in exterminating the pest. The measures referred to were started in late September last and were suspended after about three weeks in order that a comprehensive idea of the distribution of the pest and the approximate cost of extermination might be obtained before further funds in connection with the removal of plants were expended. The Government has now decided, in view of the extensive distribution which the pest has been found to have in the country, to confine its measures with respect to it to preventing its further dissemination with nursery stock and to inducing owners of infested trees to use suitable sprays to suppress it where it is known to occur. Action along these lines has already been started and will be vigorously prosecuted.

Three further cases of infestation came to light during May, all being discovered in the course of the inspection of suspected places. One was at a farm near Boskop, in the Potchefstroom District, and appeared to be confined to two apple trees purchased with many others from the Natal nursery in 1911. The infested trees were removed and destroyed. The second was on a farm near Klip River, in the Heidelberg District, and appeared to be confined to two apple trees purchased with many others from the Natal nursery in 1909. The infested trees were also destroyed in this case. The third is at Frere, Natal, and here the pest was found on several adjacent premises and more or less common on several hundred trees. This infestation is probably one of the oldest in the country. Trees from various sources and a large number of seedling trees grown on the places from pips are involved, and it is doubtful if the source of the infestation can now be fixed with reasonable certainty; but a few trees from the Natal nursery that was infested were supplied in 1906 for planting in one of the now infested gardens, and it is therefore suspected that infestation was introduced with them.

Correspondence.

This section will be set aside for correspondence on all subjects affecting the Farming Industries of the Union of South Africa and cognate matters; and, while every reasonable latitude will be allowed, contributors are requested to be as concise and succinct as possible in the expression of their views.

Suggestions for practical consideration and discussion, and hints as to improved methods applicable to any branch of agriculture will be particularly welcome.

It must at all times be distinctly understood that the Department of Agriculture is in no sense responsible for the views and opinions expressed in this section.

All communications should be clearly addressed "The Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria", and written on one side of the paper only.

DESTROYING BABOONS.

To the Editor of the *Agricultural Journal.*

Sir,—In your issue of April, 1912, page 570, B. J. v. A. has asked for information as to how to destroy baboons and monkeys.

Take some detonators or dynamite caps, and sprinkle a few mealies, pumpkin seeds or anything they eat, in little lots, and drop a detonator in each lot on their feeding ground; also put some on bits of twigs or branches of wild fruit trees. The detonator being bright, Mr. Inquisitive Baboon will bite it to see what it is, and it will blow half his head off.

You must be careful and inform the natives not to touch the detonators should they find any; the youngsters may scratch them inside or knock them on stones: if they do the chances are they will be crippled.—Yours, etc.,

W. R. Life.

P.S.—By putting a detonator into a sweet potato and laying it in the wild pigs' track it serves them the same way. And I think if detonators were put in meal it would kill the jackals as well. They would not taste it like they do poisoned meal.

Roodebloem, Rustenburg.

To the Editor of the *Agricultural Journal.*

Sir,—I see in the *Journal* that a correspondent in Bedford asks for advice as to how to exterminate monkeys. A friend has recommended the following remedy.

Take arsenic boiled with mealies and mixed with sugar, and put at places they frequent most. My friend tells me he killed 55 the first time he tried it.—Yours, etc.,

Fred. Oosthuizen, Sr.

Freyensfontein, Aberdeen, C.P.

DYNAMITE FOR TRENCHING.

To the Editor of the *Agricultural Journal.*

Sir,—*Re* Mr. Garlick's enquiry for information *re* "Dynamite for Trenching", I have at present no personal experience on this matter, but have before me a booklet on the subject which gives the particulars Mr. Garlick seeks. It says:—

"For all fruit or ornamental trees, and for many field or garden crops, especially in tight, dry soils, holes should be blasted with ½ cartridges of dynamite at intervals of 15 to 20 feet.

"Make a hole with auger, sharpened wood, dibber, or crowbar, well down into the subsoil from 3 to 4 feet, and tamp well with moist clay."

The size of the cartridge alluded to is the ordinary 1¼ × 8 inches, and the booklet contains some fine illustrations of vine orchards showing contrasts strongly in favour of dynamite over spade trenching.—Yours, etc.,

Alfred Twite.

Modderfontein, Transvaal.

BACK NUMBERS OF *AGRICULTURAL JOURNAL.*

To the EDITOR of the *Agricultural Journal.*

SIR,—I have all the copies, i.e. from October, 1902, onwards, of the *Transvaal Agricultural Journal*, with the exception of Nos. 6, 7, and 8 of 1904 (January, April, and July), and am naturally very anxious to obtain these, so as to complete my set.

Has any reader perhaps spare copies of these numbers which he is willing to part, with please. I am quite willing to pay for them if necessary.—Yours, etc.,

H. S. REYNOLDS.

HOME REMEDIES FOR LIVE STOCK.

To the EDITOR of the *Agricultural Journal.*

SIR,—In the April, 1912, number of the *Agricultural Journal* I read with interest some "Home Remedies for Live Stock," by Mr. Th. H. Dale.

Permit me to add another most valuable home remedy against the blowing up of cattle, etc., which very often happens through eating lucerne, and sometimes through eating mealies, manna, and other food. Give the animal a pill of ordinary wagon-grease, which each farmer is supposed to have handy, as large as a middle-sized potato. If one does not help soon, give another dose. This remedy has been repeatedly tried by myself and some of my friends and invariably proved successful. It's a simple, cheap, and effective cure and should prove a boon to cattle-owners. Naturally the size of the pill varies according to the size of the animal.—Yours, etc.,

A. R. FLEISCHACK.

P.O. Box 64, Potchefstroom.

Questions and Answers.

These pages will be devoted to questions, and an endeavour made to reply to all inquiries upon agricultural topics of general interest, or concerning any of the articles published from time to time in the *Journal*. In all cases replies will be posted to correspondents so soon as same have been procured.

Correspondents are requested to write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the *Agricultural Journal*, Department of Agriculture, Pretoria.

NORTH DEVON CATTLE.

C. H. Thornton, P.O. Indwe, C.P., writes :—I should be glad of information relative to the advantages and disadvantages of North Devon cattle as a general utility breed for high veld. For the purpose of breeding up with a good North Devon bull, what should be the predominating strain in the cows—Friesland, Shorthorn, or other ?

Answer.—The Lecturer in Agriculture and Stock, Grootfontein School of Agriculture, replied :—North Devon cattle as utility for your district possess the advantage of hardiness and capacity to keep flesh. They are only medium sized, but are good grazing cattle. As milkers they are not above the average and of course are not to be compared with the Friesland in amount. One presumes that you would do little feeding. If your foundation cows are of a Shorthorn type and capable milkers, your herd will more quickly assume one type if a Devon is used as bull, and there will be much less tendency to get badly coloured

SOYA BEANS.

A. Herbert, Umsunduzi, Zululand, writes :—I have a farm on the Umfolosi Flats and am desirous of planting soya beans between the rows of cane that are six feet apart. Could you inform me as to time of planting, the distance between the rows, also any further information regarding the above ?

Answer.—The Farm Manager, Central Experiment Farm, Cedara, Natal, replied :—(1) September is the most suitable time to plant on the coast, but later sowing will have no very serious consequences and may be governed by the time at which it is necessary to plant the cane. (2) If the cane rows are six feet apart beans should be sown in one single line between the rows. The soya bean is particularly liable to suffer from overcrowding and the canopy formed by the growing cane on either side will preclude the possibility of two rows of inter-planted beans, as they would then be dominated too much by the cane. (3) Plants should be spaced about two inches apart in the row. With six-foot rows about twelve pounds of seed per acre will be required, which should be drilled in about two inches deep.

LUCERNE.

I. M. Baikie, P.O. Kroondal, via Rustenburg, asks for information in regard to the cultivation of lucerne.

Answer.—The General Manager, Experiment Farm, Potchefstroom, replied :—I am afraid it is not possible to give definite data. Much depends upon the suitability and fertility of the soil for this crop ; also upon the management. It may, however, be stated that on good and suitable land under irrigation, the yield of lucerne hay commonly averages about three tons per acre per annum. The cost of production cannot well be stated, as it varies greatly under different conditions. It may, however, be assumed that it will cost £4 to £5 per acre to get the crop established. The cost of production will again depend upon whether and to what extent manuring has to be carried out, in order to grow the crop successfully. It may, however, be added that on suitable land, and under favourable local conditions, lucerne is one of the most profitable crops which can be grown.

LIME-WASHING TRUNKS OF TREES.

O. Brigg, Herschel, asks for information regarding lime-washing trunks of fruit-trees.

Answer.—The Government Horticulturist replied:—The practice of white-washing the trunks of fruit-trees from the ground to the fork is more or less universal. There is really no reason why any one should not follow this practice if they should so desire. It is not objectionable from any point of view and denotes a certain amount of interest and care on the part of the owner of the fruit-trees. But as a matter of utility and from an insecticidal point of view, it may be entirely neglected. It is hardly to be supposed that white-washing the trunk of a tree is of any real benefit, excepting in such cases where the top of a tree has been removed in order that the remaining stump may be grafted to some other variety. White-washing then is justifiable and highly necessary, as it prevents the scalding of the bark by the hot rays of the sun, and thus prevents disease and consequent decay. Again, the white-washing of stems of young trees during the first and second years of their growth, when they have not sufficient head with a spread of branches wide enough to shade the trunks from the sun, is extremely desirable; or some other method may be adopted of shading the stems. But the white-washing of the trunks of well-developed trees is merely a harmless fad, which cannot do any possible harm, and very little, if any, good.

CULTIVATION OF BAMBOOS.

A. S. Wingard, P.O. Louis Trichardt, asks for information in regard to the cultivation of bamboos.

Answer.—The Acting Government Agriculturist, Middelburg, C.P., furnishes the following reply:—If long, thick, bamboos are required, deep soil is necessary and plenty of water. To produce whip sticks, hard, stony soil is required, and what is chiefly needed is a spot not subject to much frost; that is why Schoeman's Hoek produces the best whip-sticks, being in front of the Schoeman's Poort there is a continual draught, which prevents frost. The bamboo is usually propagated by planting out the roots about a yard apart. The best time for planting out is in the early spring, and they should be watered once a month until well established, after which they should be irrigated every three months.

SALTING BUTTER.

Mrs. H. Bird, Vlakplaats, P.O. Villiers, writes:—In dry-salting butter for winter use would you kindly tell me the exact quantity of salt to be used to each pound of butter, and are enamel buckets good to keep the butter in?

Answer.—The Superintendent of Dairying replied:—It is impossible to mention the exact quantity of salt to be used for butter for keeping purposes, as this will vary with the taste of the consumer. However, not less than five pounds of pure fine salt should be used for every hundred pounds of butter. There would be no objection to use an enamelled bucket, into which the butter is packed, provided there are no holes or cracks in the enamel coating, however small, which will expose the metal and cause rusting and impart a bad flavour to the butter. If possible there should be no seams which are difficult to clean. If the butter is well made, worked, salted, and packed, it will keep good for several months when stored in a cool, clean, and dark place. An extra precaution may be taken by covering the top of the butter with a thin layer of salt and a cloth.

BEE-SCORPIONS.

J. H. N. Martenson, Goodhope, District Vredefort, writes:—I have altogether five Danzenbaker hives and only one of the lot is not infested with the bee-scorpion. It is a little red insect, resembling a scorpion in miniature, and seems to multiply most marvellously. Can you give me any information how to get rid of this pest, as my bees do not seem to thrive at all where these insects are in the hives?

Answer.—The Chief, Division of Entomology, replied:—The creatures referred to are known in books as pseudo-scorpions or chelifers (family *Pseudo-scorpiones* Latreille and *Chernetidae* Menge). They are more closely related to scorpions and spiders than to ticks or true insects, and but little is recorded of their economy. So far as I know every one who has studied them regards them as practically harmless, but their very common occurrence in bee nests in this country leads me to wonder if the books are quite right. It is said that their food consists of minute creatures, such as mites and psocids (soft louse-like creatures that feed chiefly on dead plant matter), and it is quite possible that they frequent bee nests entirely to prey upon such tiny scavengers. Their habit of clinging to winged insects is a very well-known one in other countries, but in South Africa bees are, apparently, made

the means of transport to a greater extent than is usual elsewhere. It is supposed that the attachment is merely to get carried to more suitable surroundings. The presence of the creatures in hives has been observed by me many times, and is frequently reported in letters from correspondents, but never yet have I secured any good evidence that harm to the bees was being done. Generally only a few of the creatures are present. The only measure I have to suggest as a remedy is that the hives be examined occasionally with the object of catching and destroying them.

A PUMPING-PLANT QUERY.

Geo. H. Croote, Roodepoort, asks for advice as to the laying down of a small pumping-plant in rainy seasons. He adds:—I have plenty of water, but during this drought it became very scarce, so I propose to dig a well, say, 20 feet deep, and then I expect to have 15 feet of water, and I should like to force the water up 200 yards at a gradient of about 1 in 20. I should also like power to drive a small mealie-mill and chaff-cutter. I should most likely only require to pump much from September until the rain comes, say, December, so, of course, generally speaking, the engine would only require to be driving at most two of those mentioned.

Answer.—The Acting Director of Irrigation replied:—Correspondent wishes to raise water from a well which he proposes sinking in the river bed, and force it through pipes a distance of 200 yards to a height of 30 feet. He does not state the quantity of water he expects to pump, or the amount of ground he wishes to irrigate, so it is impossible to furnish full details. A 5-brake horse-power engine will drive a pump capable of pumping sufficient water to irrigate a few morgen; this engine will also serve to drive a mealie-crusher, chaff-cutter, etc.

HYDRAULIC RAMS.

R. A. Taylor, Empangeni, Zululand, asks for particulars *re* hydraulic rams to raise water 60 feet high through 200 yards of piping from a supply of 100 gallons per hour, with a fall of 10 feet.

Answer.—The Director of Irrigation replied:—This supply of water is not sufficient to supply even the smallest ram made. The other conditions are very favourable for a ram, but a supply of at least 600 gallons per hour is required to warrant the expense of such a plant. With a supply of 600 gallons per hour, working under the above conditions, with a suitable ram, about 50 gallons per hour could be raised.

Results of Egg-Laying Competitions.

WESTERN PROVINCE AGRICULTURAL SOCIETY.

Fourth Egg-Laying Competition.—16th May, 1911, to 15th May, 1912.

FINAL RESULTS.

Owner.		Pen Number.	Breed.	Totals.		
				Eggs.	Weight. oz.	drms.
1st	A. J. Stacy......	15	White Leghorns (Aust.-Amer.)	777	1649	8
2nd	S. Smith	26	White Leghorns (Dan. & Amer.)	850	1648	9
3rd	B. Kauffmann ...	16	White Leghorns (Eng.-Amer.)..	781	1638	13
4th	C. H. van Breda..	21	White Leghorns (Aust.)	830	1614	15
5th	W. P. Cowan	14	White Leghorns (Eng.)........	799	1573	6
6th	Graham, Hope & Co.	24	White Wyandottes	740	1479	8
7th	H. H. Bright.....	10	Black Leghorns	711	1409	0
8th	N. Cole	19	Brown Leghorns..............	664	1394	15
9th	Mrs. H. H. Bright	18	White Leghorns (Aust.).......	704	1356	3
10th	Mrs. C. H. van Breda	22	White Leghorns (Amer.).......	684	1334	1
11th	H. Curtis..	6	White Leghorns (Amer.)	632	1314	10
12th	B. Kauffmann ...	11	Brown Leghorns	647	1297	3
13th	S. T. Jones	5	White Leghorns (Amer.)	575	1249	13
14th	F. Molteno	20	White Leghorns (Amer.)	664	1230	8
15th	S. A. West.......	9	White Leghorns (Amer.-Danish)	564	1224	0
16th	C. W. Pilkington .	13	Rhode Island Reds	555	1209	4
17th	S. A. West.......	23	Brown Leghorns	626	1188	6
18th	B. Kauffmann ...	12	Black Leghorns	551	1183	4
19th	N. Cole	4	White Leghorns (Amer.)	597	1176	5
20th	S. Smith	17	Brown Leghorns	565	1161	1
21st	S. C. Skaife......	7	White Wyandottes............	624	1141	2
22nd	R. V. R. Jones...	25	White Leghorns (Amer.-Aust.) .	551	1094	9
23rd	A. Keppie.......	8	White Wyandottes............	554	1020	2
24th	F. T. Hobbs	2	Silver Wyandottes............	468	918	6
25th	F. W. Nicholson..	1	Buff Orpingtons..............	425	895	7
26th	A. Riley.........	3	Black Minorcas (R.C.).........	314	621	9

DEATHS AND REPLACEMENTS.

In the case of replacements, the dead birds' scores have been deducted from the respective pen totals.

Pen No. 3 (A. Riley).—One died; replaced 23rd October, 1911. Score, 68 eggs; weight, 123 oz. 5 drms.

Pen No. 4 (N. Cole).—One died; replaced 4th November, 1911. Score, 62 eggs; weight, 110 oz. 14 drms. One died 14th February, 1912; not replaced.

Pen No. 5 (S. T. Jones).—One died; replaced 26th October, 1911. Score, 39 eggs; weight, 80 oz. 14 drms.

Pen No. 6 (H. Curtis).—One replaced 22nd November, 1911. Score, 58 eggs; weight 124 oz. 11 drms.

Pen No. 7 (S. C. Skaife).—One died 28th February, 1912; not replaced.

Pen No. 9 (S. A. West).—One died 5th November, 1911; not replaced.

Pen No. 11 (B. Kauffmann).—One died; replaced 3rd November, 1911. Score, 63 eggs; weight, 140 oz. 10 drms.

Pen No. 12 (B. Kauffmann).—One died; replaced 28th September, 1911. Score, 38 eggs; weight, 78 oz. 4 drms.

Pen No. 13 (C. W. Pilkington).—One died 29th January, 1912; not replaced.

Pen No. 16 (B. Kauffmann).—One died 18th November, 1911; not replaced.

Pen No. 18 (H. H. Bright).—Two died 2nd November, 1911; not replaced.

Pen No. 19 (N. Cole).—One died; replaced 27th August, 1911. Score, 35 eggs; weight, 74 oz. 10 drms.

Notes on the Weather.

NATAL.—APRIL.

TEMPERATURE.

STATIONS.	Temperature (in Fahr. Degrees). Means for Month. Max.	Min.	Monthly Mean.	Abs. Max.	Abs. Min.	Mean Daily Range.
	°	°	°	°	°	°
Observatory, Durban	80 ·6	64 ·1	72 ·4	86	60	16 ·5
Stanger	83 ·6	63 ·1	73 ·4	93	69	20 ·5
Verulam	83 ·9	62 ·0	73 ·0	95	57	21 ·9
Hillary	78 ·7	63 ·3	70 ·0	84	59	15 ·4
Umbogintwini	82 ·9	60 ·4	71 ·7	87	55	22 ·5
Winkel Spruit	—	—	—	—	—	—
Umzinto	—	—	—	—	—	—
Port Shepstone	80 ·5	62 ·7	71 ·6	87	57	17 ·8
Imbizana	81 ·1	61 ·4	71 ·3	90	57	19 ·7
Harding	81 ·6	50 ·5	66 ·1	89	44	31 ·1
Mid-Illovo	74 ·5	59 ·4	67 ·0	87	52	15 ·1
Bulwer	68 ·3	49 ·4	58 ·9	77	37	18 ·9
Himeville	75 ·3	43 ·2	59 ·3	83	35	32 ·1
Richmond	—	—	—	—	—	—
Pietermaritzburg (Burger Street)	82 ·2	53 ·4	67 ·8	95	39	28 ·8
Howick	82 ·3	51 ·0	66 ·7	91	40	31 ·3
Cedara Vlei	—	—	—	—	—	—
Albert Falls	83 ·3	56 ·3	69 ·8	97	46	27 ·0
New Hanover	81 ·7	52 ·7	67 ·2	96	43	29 ·0
Greytown	78 ·7	51 ·5	65 ·1	92	42	27 ·2
Krantzkop	84 ·4	52 ·7	68.6	92	47	31 ·7
Lidgetton	79 ·9	37 ·1	58 ·5	93	28	42 ·8
Nottingham Road	75 ·9	42 ·1	59 ·0	85	32	33 ·8
Estcourt	94 ·7	51 ·8	73 ·3	100	43	42 ·9
Weenen	80 ·9	50 ·0	65 ·5	90	42	30 ·9
Mpofana	—	—	—	—	—	—
Ladysmith	81 ·3	51 ·8	66 ·5	89	43	29 ·5
Dundee	75 ·6	52 ·6	64 ·1	85	46	23 ·0
Newcastle	80 ·6	43 ·6	62 ·1	87	36	37 ·0
Utrecht	—	—	—	—	—	—
Vryheid	78 ·2	52 ·4	65 ·3	88	46	25 ·8
Paulpietersburg	78 ·8	51 ·4	65 ·1	89	45	27 ·4
Ngomi Forest	74 ·9	53 ·8	69 ·4	85	50	21 ·1
Ingwavuma	79 ·2	60 ·2	69 ·7	89	55	19 ·0
Ubombo	77 ·9	61 ·3	69 ·6	87	56	16 ·6
Nongoma	81 ·3	55 ·6	68 ·5	91	48	25 ·7
Hlabisa	80 ·7	62 ·7	71 ·7	85	60	18 ·0
Mahlabatini	79 ·8	57 ·3	68 ·6	95	53	22 ·5
Melmoth	—	—	—	—	—	—
Empangeni	81 ·7	60 ·9	71 ·3	96	54	20 ·8
Mtunzini	85 ·1	54 ·3	69 ·7	93	49	30 ·8
Amatikulu	—	—	—	—	—	—
MEANS	80 ·3	54 ·6	67 ·6	—	—	25 ·7
EXTREMES	—	—	—	100	28	—

OBSERVERS' NOTES.

Imbizana.—A hot, dry April has followed the other months of a hot, dry summer, so that we begin the winter with all the small streams dried up, the grass quite brown and the ground dry. Unless we get good rains in May the winter prospects are very bad. Crops are proving very short throughout the district, the natives not having nearly enough for their requirements. East Coast fever is still in the district but seems to have now nearly run its course. Stock of all kinds are looking well. (C. H. Mitchell.)

Mid-Illovo.—The total rainfall during April has only amounted to 2·42 inches, the heaviest downpour being registered on Sunday, 7th instant: 1·11 inches (a cold rain lasting until the following morning). On the night of the 15th 0·72 inch fell, and on the 27th a thunderstorm accompanied by a little hail produced 0·24, but nevertheless the country is still wearing its verdant summer costume, though here and there a brown tint may be observed commencing to assert its right. The maximum heat, 87°, was registered on the 22nd, and the minimum on the night of the 7th, 52°. Not many cases of horse-sickness have been reported, and stock is looking well, in several instances restocking is commencing, fencing and dipping tanks having been erected. The maize crop is fast ripening, and green winter crops are looking well. A fair millet crop (amabele) has been reaped. (J. W. V. Montgomery.)

Nottingham Road.—Slight frosts have been recorded, the heaviest being at Lidgetton. Occasional cases of horse-sickness still occur. Harvesting is nearly finished; a wet Easter spoiled a lot of hay. Blue-tongue in sheep has been very bad, especially at Loteni.

Ngomi Forest.—The total rainfall for the month of April was 2·71 inches, this is much lower than the rainfall in April, 1911, when 4·99 inches were registered, but a little higher than April, 1910, which was 2·66 inches. Only one heavy rain has been registered during this month, that was on the 7th, when 2·22 inches of rain fell. During the month there have been two light passing thunderstorms on the 3rd and 5th. Taking the month all through we have had fine weather. Temperatures for month, maximum 84°, minimum 50°, means 74·9, minimum 53·5. Most of the crops are now being reaped and from what I can understand, are not so bad. By the amount of mealies the natives are selling they seem to have reaped a fair crop. They are selling their mealies to get money to pay their hut tax. Stock are looking in fine condition. (W. H. Foster, *Forester.*)

Nongoma.—Very little rain fell during the month, the heaviest fall being on the 8th, when 1·40 inches were registered. The temperature has been very mild, there being no very hot or very cold weather experienced, in fact the month being practically all sunshine and balmy. The veld is still very green on the hills, and very little grass has so far been burnt. Even in the low lying country the grass is still unburnt, although small patches here and there have been burnt by the natives for grazing for their stock. (J. R. Bennett, *Magistrate.*)

Empangeni.—The weather during the month of April has been very fair with refreshing showers of rain to freshen things up. No gales of wind to speak of. Rainfall for the month being 2·73 inches. Only one storm passed, on the 7th, when 1·38 inches fell. Stock in the district continue to look well, and the climate is becoming much cooler. (H. Tarboton, *Forester.*)

TRANSVAAL.—APRIL.

SUMMARY.—The rainfall has been fairly evenly distributed over the month, and has exceeded the average in amount. The season's rainfall (ten months) still shows a deficit in all but the south-western districts and along the extreme south of the Province. The shortage remains considerable in many parts, Leydsdorp still requiring about ten inches, Pietersburg and Potgietersrust nine, and Zeerust eight inches to reach the average.

OBSERVERS' WEATHER REPORTS.

BETHAL DISTRICT—

Leeuwkuilen.—On three occasions during April we all but had frost, viz., the 10th, 20th, and 29th, the Gras minimum thermometer going down to 34·5 and 35 degrees, and the following days going up 8 to 10 degrees. Some of my neighbours to the south have reported slight frost on the 10th and 29th. We had quite a good lot of fine hail during the night of the 27th inst., which did no damage. The rain was cold. The last five days of the month we had beautiful warm days and bright skies. (W. J. Wayland.)

ERMELO DISTRICT—

Fettercairn.—Weather has been very mild for the time of year. There has been no frost during the month so far as I could see. This is a phenomenon which has not occurred for the last six years. (A. Middleton.)

LICHTENBURG DISTRICT—

Lichtenburg.—The weather during the month has shown a scarcity of clear fine days. Heavy mists have been prevalent, and on the 16th, 17th, 18th, 28th, and 30th heavy dew

fell. The nights have, as a rule, been fairly clear, with bright starlight, except on occasions when rain was in vicinity. Heavy Nimbus, Cumulus, and Strato Cumulus clouds were the rule. Most rain was unaccompanied by thunder, except on the night of the 26th, when the thunder and lightning was extremely heavy, waking most people. The 28th, 29th, and 30th were clear, bright, sunny days. Slight hail on afternoon of 27th; the hail was extremely fine. The rain seemed to travel in circles, wind blowing east-south-east, then reversing, and bringing the rain. (Fred A. Eitzen.)

LYDENBURG DISTRICT—

Belfast.—With the exception of the welcome rain which fell at the close of the month it has been particularly dry. Heavy black clouds were prominent throughout the month. The Gras minimum thermometer on the mornings of the 22nd, 29th, and 30th recorded 28·6, 30·2, and 31·3 degrees respectively. (G. J. Imrie.)

Graskop.—The majority of the rain which fell was caused by thunderstorms. Mists were prevalent during the month. (G. Irvine.)

MIDDELBURG DISTRICT—

Middelburg.—In the town of Middelburg the month of April has this year been a mild one, with no frosts as yet. The rainfall has nearly been double the average amount for the past eight years, small as this is, but it has been well distributed in showers, or a succession of them, every four days, which has done much good to the veld for winter grazing and to winter crops. The usual windy, dusty days of winter have been conspicuously absent, as yet the prevailing winds being northerly. The country wears a handsome autumnal appearance still, the rich colouring of the leaves, left on later than usual by the absence of high winds, being particularly pronounced this year. (Dr. H. A Spencer.)

POTCHEFSTROOM DISTRICT—

Ventersdorp.—Slight frost along the Schoonspruit at end of month. (W. M. Cheyne.)

RUSTENBURG DISTRICT—

Zandfontein.—Mornings and evenings have been getting much colder during the latter part of the month, but no frost has fallen yet. Crops appear to be getting ripe, and no damage is expected from frosts now. (R. Boon.)

STANDERTON DISTRICT—

Standerton.—Clear and cold mornings and warm days were the features of the month. (A. von Backstrom.)

ZOUTPANSBERG DISTRICT —

Kalkfontein No. 129.—The weather this month has been bright and genial, with a few cold days towards the latter part. (C. Newham.)

Louis Trichardt.—A month of very high temperatures, but with little relief in the shape of cooler nights. The mean temperature was higher than that of March and 6 degrees higher than the average for April. There has been an almost entire absence of mist, which is usually a feature of the mornings at this season of the year. (Sergt. J. C. N. Clark.)

TEMPERATURE.

PLACE.	OBSERVER.	For the Month. Mean Max.	Mean Min.	Mean.	Average Mean during past nine years.	Difference from Average Mean.
		°	°	°	°	°
Barberton..........	H. G. Williams.....	77·4	59·3	68·4	*67·2	+ 1·2
Bloemhof..........	C. C. Campbell.....	75·1	49·4	62·2	*62·1	+ 0·1
Johannesburg—						
Joubert Park....	Geo. Weeks........	70·0	49·5	59·8	59·3	+ 0·5
Observatory......	Staff..............	68·2	49·7	59·0	*58·9	+ 0·1
Komatipoort.......	H. J. Evans.......	86·9	64·1	75·5	72·7	+ 2·8
Pietersburg.... ..	W. Frankleyne....	80·6	55·0	67·8	*63·9	+ 3·9
Pretoria, Arcadia...	J. Lyall Soutter....	73·1	51·6	62·4	62·9	— 0·5
Volksrust..........	Station Master, S.A.R.	72·6	49·8	61·2	56·2	+ 5·0
Zeerust............	H. Dietrich, J. P...	79·2	51·2	65·2	63·6	+ 1·6

*Average for eight years.

The average day temperature throughout the Province has been practically normal, although in different parts it has varied from 3° above to 4° below. The average night temperature has been about 3° above the normal. A few frosts have, however, been recorded.

Rainfall Returns.

CAPE PROVINCE—APRIL.

I. CAPE PENINSULA:	Inches.
Royal Observatory (a) 12-inch gauge	3·32
Sea Point (The Hall)	3·62
Camp's Bay	3·48
Devil's Peak Blockhouse	3·78
Woodstock (The Hall)	3·69
Bishopscourt	3·75
Kenilworth	2·45
Wynberg (St. Mary's)	7·49
Groot Constantia	2·12
Tokai Plantation	3·40
Cape Point	1·80
Robben Island	2·33
Maitland Cemetery	2·94
Tamboers Kloof	4·94

II. SOUTH-WEST:	
Eerste River	1·32
Klapmuts	2·60
Stellenbosch (Gaol)	2·24
Somerset West	1·50
Paarl	1·95
Porterville Road	2·12
Kluitjes Kraal	1·52
Ceres	1·86
Rawsonville	0·81
Caledon	0·99
Worcester (Gaol)	0·25
Lady Grey (Division Robertson)	0·41
Robertson (Gaol)	1·20
Do. (Govt. Plantation)	1·05
Elgin Plantation	1·83
Elsenberg Agricultural College	2·31
Roskeen	0·92
Vruchtbaar	2·33
Waverley	1·63

III. WEST COAST:	
Anenous	0·23
Klipfontein	0·27
Kraaifontein	0·02
Springbokfontein	0·18
Concordia	0·12
Concordia (Krapohl)	0·07
Garies	0·50
Lilyfontein	0·66
Van Rhyn's Dorp	0·29
Kersefontein	1·16
The Towers	1·12

III. WEST COAST (*continued*):	Inches.
Malmesbury	1·06
Wupperthal	0·04
Algeria	1·29
Cedarberg	1·62
Hopefield	0·76

IV. SOUTH COAST:	
Swellendam	3·12
Heidelberg	1·29
Riversdale	1·07
Millwood	4·22
Sour Flats	3·79
Concordia	3·39
Buffel's Nek	5·37
Plettenberg Bay	2·46
Harkerville	3·42
Witte Els Bosch	4·43
Humansdorp	7·19
Uitenhage (Gaol)	5·24
Do. (Park)	5·53
Do. (Inggs)	5·41
Armadale (Blue Cliff)	3·35
Dunbrody	3·26
Port Elizabeth (Harbour)	3·15
Do. (Emerald Hill)	3·85
Shark's River (Nursery)	3·33

V. SOUTHERN KAROO:	
Triangle	0·15
Pietermeintjes	0·97
Ladismith	1·75
Amalienstein	1·59
Calitzdorp	2·38
Uniondale	2·08

VI. WEST CENTRAL KAROO:	
Dunedin	1·17
Nels Poort	1·86
Camfers Kraal	1·30
Krom River	1·65
Willowmore	1·58
Rietfontein	0·91
Steytlerville	2·97
Lemoenfontein	2·07

VII. EAST CENTRAL KAROO:

	Inches.
Klipplaat	1·29
Graaff-Reinet (Gaol)	1·62
Do. (Eng. Yard)	1·55
New Bethesda	0·98
Glen Harry	1·04
Wellwood	1·32
Bloemhof	0·98
Jansenville	1·72
Roode Hoogte	1·41
Klipfontein	1·95
Somerset East (Gaol)	2·90
Cookhouse	3·40
Spitzkop (Graaff-Reinet)	2·07
Zeekoe Rivier	3·31

VIII. NORTHERN KAROO:

	Inches.
Sutherland	0·21
Wildebeestkooij	4·71
Richmond	2·33
Theefontein	3·88
Philipstown	2·10
Petrusville	3·83
The Willows (Middelburg)	2·42
Middelburg (Gaol)	0·92
Colesberg	2·86
Culmstock	1·03
Maraisburg	1·16
Steynsburg (Gaol)	2·49
Tarkastad	1·45
Waverley	1·75
Vosburg	2·25
Zwavelfontein	0·73
Ruighterfontein	2·01
Thebus Waters	1·04

IX. NORTHERN BORDER:

	Inches.
Pella	0·00
Kenhardt	0·25
Trooilapspan	1·32
Van Wyks Vlei	0·48
Prieska	0·98
New Year's Kraal	2·22
Karree Kloof	2·75
Douglas	1·31
Do. (Martin)	1·27
Hopetown	1·27
Newlands (Barkly West)	2·37
Barkly West	1·77
Kimberley Stephens	2·49
Strydenburg	1·64
Koegas	2·16
Rietfontein	0·45
Rocklands	3·17
Stoffkraal	0·75
Sydney-on-Vaal	2·61
Warrenton	3·82

X. SOUTH-EAST:

	Inches.
Melrose (Division Bedford)	1·79
Dagga Boer	2·85
Cheviot Fells	1·65
Bedford (Gaol)	5·28
Adelaide	3·20

X. SOUTH-EAST (*continued*):

	Inches.
Atherstone	3·97
Alexandria	3·82
Grahamstown (Gaol)	3·88
Heatherton Towers	3·41
Fort Beaufort	3·74
Katberg	3·39
Seymour	3·31
Glencairn	4·80
Hogsback	4·68
Peddie	3·47
Keiskamma Hoek	2·49
Thaba N'doda	3·72
Evelyn Valley	5·90
Crawley	2·29
Pirie Forest	3·34
Isidenge	3·32
Kologha	3·14
Kingwilliamstown (Gaol)	2·11
Kubusie	3·00
Quacu	2·72
Bolo	2·18
Fort Jackson	3·50
Komgha (Gaol)	4·01
Chiselhurst	9·81
Cata	3·42
Wolf Ridge	2·42
Dontsah	3·20
Mount Coke	2·71
Albert Vale (near Bedford)	3·41
Huxley Farm	1·97
Izeleni	3·18
Middle Drift	2·92

XI. NORTH-EAST:

	Inches.
Venterstad	2·30
Mooifontein	2·86
Burghersdorp (Gaol)	3·03
Ellesmere	2·43
Thibet Park	1·80
Sterkstroom (Gaol)	1·72
Rocklands	1·64
Aliwal North (Gaol)	1·85
Jamestown	2·34
Queenstown (Gaol)	0·14
Middlecourt	1·70
Herschel	4·50
Lady Grey	5·38
Lady Frere	1·46
Keilands	1·09
Barkly East	2·11
Hughenden	1·59
Indwe	1·42
Avoca (Barkly East)	4·23
King's Leigh (Albert)	2·63
Sunnymeade	2·48

XII. KAFFRARIA:

	Inches.
Ida (Xalanga)	1·41
Slaate (Xalanga)	1·23
Tsomo	2·02
N'qamakwe	2·55
Engcobo	2·47
Butterworth	1·71
Kentani	3·30

XII. KAFFRARIA (*continued*):	Inches.	XII. KAFFRARIA (*continued*):	Inches.
Maclear	1·88	Flagstaff	1·06
Idutywa	2·44	Umzimkulu	1·49
Willowvale	2·69	Clarkebury	2·18
Somerville (Tsolo)	1·05	Elton Grange	2·08
Cwebe	2·83	Lusikisiki	0·95
Tabankulu	1·91	N'dabakazi	2·11
Kokstad	1·77	Sihota	3·17
Do. (The Willows)	1·64	Tentkop	1·74

NATAL—APRIL.

	Inches.		Inches.
Durban (Observatory)	1·43	Estcourt	2·25
Stanger	2·75	Weenen	2·55
Verulam	2·31	Mpofana	—
Hillary	1·82	Ladysmith	2·42
Umbogintwini	2·20	Dundee	2·82
Winkle Spruit	—	Newcastle	2·46
Umzinto	—	Utrecht	—
Port Shepstone	1·50	Vryheid	4·64
Imbizana	1·47	Paulpietersburg	2·81
Harding	1·15	Ngomi Forest	2·71
Mid-Illovo	2·42	Ingwavuma	2·90
Bulwer	2·61	Ubombo	3·84
Himeville	2·59	Nongoma	2·27
Richmond	-	Hlabisa	2·48
Pietermaritzburg (N. G. Asylum)	1·37	Mahlabatini	3·30
Howick	1·11	Melmoth	—
Cedara Vlei	—	Empangeni	2·73
Albert Falls	1·59	Mtunzini	6·45
New Hanover	2·49	Amatikulu	—
Greytown	0·97	Durban (Point)	2·65
Krantzkop	2·30	Pietermaritzburg (Burger Street)	1·69
Lidgetton	1·71	Bushman's Nek	4·62
Nottingham Road	2·67		

TRANSVAAL—APRIL.

	Inches.		Inches.
Barberton	3·53	Potchefstroom	5·11
Komatipoort	4·86	Klerksdorp	4·09
Bethal	1·76	Pretoria (Arcadia)	1·48
Bloemhof	1·75	Modderfontein	3·39
Christiana	2·77	Rustenburg	1·90
Carolina	2·26	Standerton	2·22
Ermelo	1·52	Mbabane	3·58
De Hoop	3·21	Wakkerstroom	3·91
Heidelberg	2·66	Potgietersrust	1·60
Vereeniging	6·48	Krugersdorp	2·71
Lichtenburg	3·58	Joubert Park (Witwatersrand)	3·54
Belfast	2·51	Observatory	2·93
Pilgrims Rest	3·33	Pietersburg	1·15
Zeerust	1·54	Louis Trichardt	1·98
Middelburg	2·23	Leydsdorp	2·16
Piet Retief	2·56		

Outbreaks of Animal Diseases.

THE following outbreaks of scheduled infectious and contagious animal diseases have occurred in the areas specified during the month ended 31st May, 1912.

C. E. GRAY,
Principal Veterinary Surgeon (Union).

CAPE PROVINCE PROPER.

(EXCLUDING TRANSKEIAN TERRITORIES.)

Anthrax.

District.	Area.	Number of Deaths.	Number of In-contacts.
Alexandria	Sandflats	1	Unknown
,,	Quaggasfontein	1	14
Barkly West	Daniels Kuil	1	Unknown
East London	Farm No. 60, Ward 3	1	,,
,,	Farm No. 84, Ward 3	1	,,
,,	Newlands Location, Ward 6	1	,,
,,	Van der Kemp's Location	1	,,
Komgha	Farm No. 208	2	52
,,	Farm Lot No. 1, xiii/25*b*, Kuku	1	13
,,	Farm Lot No. 4, xiii/24*b*	2	37
,,	Farm No. 18, xiii/37	1	84
Mafeking	Pitsani	1	150
,,	Grootgewagd	Unknown	Unknown
,,	Gamabot	1	,,
,,	Salem	1	,,
Uitenhage	Perseverance	22 pigs 2 cows	230 pigs 300 cattle
Victoria East	Farm Fortwiltshire, Alice	1	18

East Coast Fever.

District.	Area.	Number of Animals Sick.	Number of Animals Dead.	Number of Animals In-contact.
East London	Section 28, Paardekraal, Ward 7	nil	1	Unknown
,,	Lots Nos. 19 and 20, Paardekraal Ward 7	nil	2	,,
,,	Lot No. 27, Paardekraal, Ward 7	nil	2	,,

Glanders.

District.	Area.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of In-contact Animals Tested.
Alexandria............	Waarheuvel..........	1	nil	5
Montagu..............	Various..............	1	nil	13

Scabies (Equine).

District.	Area.	Number of animals affected.
Albany......................	Grahamstown Commonage.....	9
,, ...	Alicedale.....................	1
,, ...	Hopefontein, Salem...........	1
Humansdorp..................	Various......................	53

Swine Fever.

District.	Area.	Number of Animals Dead.	Number of In-contact Animals.
Stellenbosch...............	Somerset West.............	15	70
Paarl.......	Klapmuts..................	12	Unknown
	Hexberg, Wellington..........	27	32
	Zoetendal, Wellington.........	30	43
	Zanddrift, Wellington.........	1	40

Tuberculosis.

District.	Area.	Number of Animals Tested.	Number of Reactions to Test and Destroyed.	Number of Doubtful Reactions to be Retested.
Cape..................	Various..............	382	9	10
Malmesbury...........	,, ...	43	nil	nil
Paarl.................	,, ...	1	1	nil
Stellenbosch...........	,, ...	62	1	1

TRANSKEIAN TERRITORIES.

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of In-contacts Tested.
Idutywa..............	Mpuluse.............	—	3	—
,, ...	Village..............	—	1	—

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Port St. Johns	Government Farms Nos. 19, 20	—	—
"	Maytons	—	—
Idutywa	Poswa's Location	1	180
"	Mdlungu's Location	1	135
"	Mdyogolo's Location	4	74
"	Zenzile's Location	33	137
"	Ndible's Location	1	86
"	Nqeke's Location	3	105
"	Mzwali's Location	1	154
"	Nganda's Location	—	—
"	Colosa's Location	—	—
"	Ngcengwana's Location	—	—
Flagstaff	Njikilana's Location	1	300
"	Masipula's Location	3	26
"	Situkutezis Location	1	12
Willowvale	Gwebinkuntis Location	—	—
"	Miti's Location	—	—
"	Stata's Location	—	—
"	Daka's Location	—	—
Lusikisiki	Ntelekiso's Location	8	29
"	Qutu's Location	1	15
"	Mtalaliso's Location	2	88
Mqanduli	Remainder of Commonage	—	—
Engcobo	Sitelo's Location	2	1500
"	Mqikela's Location	—	—
"	Sondli's Location	—	—
"	Rasineni's Location	—	—
"	Ntaka's Location	—	—
"	Plaatjie's Location	—	—
"	Mugobi's Location	—	—
Mount Ayliff	Daniell's Location	1	100
"	Sigibini's Location	1	116
"	Rolobile's Location	1	4
Kentani	Maki's Location	—	—
"	Kadeni's Location	—	—
Tsolo	Josiah's Location	1	114
"	Lize's Location	2	317
"	Tsolo Outspan	1	43
"	Mjika's Location	—	—
"	Kambi's Location	—	—
"	Ferndale	—	—
"	Nqadu Forest Reserve	—	—
"	Kambi Forest Reserve	—	—
"	Tengisa's Location	—	—
Mount Currie	Badfontein	—	—
Butterworth	Bekezanti's Location	—	—
Ngqeleni	Madolo's Location	—	—
"	Duna's Location	—	—
"	Makenzina's Location	—	—
"	Mngcalani's Location	—	—
Nqamakwe	Ndzeurela's Location	—	—
Umtata	Nompenge's Location	—	—
"	Mgatula's Location	—	—
"	Sangoni's Location	—	—
Libode	Dabis Location	—	—
Tabankulu	Sitandatu's Location	—	—

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Idutywa	Poswa's Location	—	—
"	Mzwali's Location	—	—
"	Zotana's Location	—	—
"	Ndilele's Location	—	—
"	Commonage	—	—
"	Mpuluse	—	—
Engcobo	Silo's Location	—	—
"	Ngenani's Location	—	—
Butterworth	Zazeni's Location	—	—
"	Gcume's Location	—	—
"	Veldman's Location	—	—
"	Iteka Outspan	—	—
Kentani	Maki's Location	—	—
"	Geoffrey's Location	—	—
Umtata	Pondomtini's Location	—	—
"	Datindgelo's Location	—	—
"	Gololondwana's Location	—	—
Mount Frere	Commonage	—	—
Mount Fletcher	Quthing's Location	—	—

Lung-sickness.

District.	Name of Farm.	Number of Deaths.	Number of In contacts.
Tsome	Xolobe's Location	1	125
Engcobo	Mgadlwa's Location	—	—
Kentani	Dalveni's Location	—	—

NATAL.

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Upper Umkomanzi Division	Ward Hill	—	—
Dundee Division	Bannockburn	—	—

Epizootic Lymphangitis.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Lower Tugela Division	Chaka's Kraal	—	—
" "	Lot No. 15, Umhlali	1	5
Inanda Division	Herwood	5	39

East Coast Fever.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Alexandra Division........	Mimosa......................	—	—
	Trillock....................	—	—
Alfred Division	Glenora......................	—	—
Bergville Division.........	A of Zunckels Spruit.........	—	—
,, ,, ...	Castle View..................	—	—
,, ,, ...	Fair Leigh..................	—	—
,, ,, ...	Groen Vlei....	—	—
Dundee Division...........	Nkandi......................	—	—
Estcourt Division..........	Bell Park....................	—	-
Ixopo Division............	Gorton......................	—	—
Lower Umzimkulu Division	Isandhlundhlu................	—	—
,, ,,	Bude......................	—	—
Underberg Division........	S. 1.........................	—	—
,, ,, ...	The Kloof..................	—	—
Newcastle Division........	Hart River..................	1	201
N'Gotshe Division.........	Mooibank....................	1	11
Inanda Division	Prospect Hall	—	—
Upper Umkomanzi Division	Spitz Kop..................	—	—

TRANSVAAL.

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of In-contacts Tested.
Standerton...........	Town.................	1	1	—
,, ...	Vlakfontein..........	1	—	—
Ermelo..............	Vaalkop No. 167.....	1	—	—
Potchefstroom........	Ventersdorp..........	1	—	—

Anthrax.

District.	Name of Farm.	Number of Deaths.	Number of In-contacts.
Lichtenburg.............	Kaalpan....................	40	Flock of sheep.

ORANGE FREE STATE.

Glanders.

District.	Name of Farm.	Clinically Affected and Destroyed.	Reacted to Test and Destroyed.	Number of In-contacts Tested.
Harrismith............	Bavaria..............	1	1	8
,, ...	Hamelberg...........	1	1	—

Agricultural Show Dates, 1912.

NATAL PROVINCE.

Klip River (Ladysmith).—Tuesday and Wednesday, 18th and 19th June.
Weenen (Estcourt).—Thursday and Friday, 20th and 21st June.
Umvoti (Greytown).—Thursday and Friday, 20th and 21st June.
Lion's River.—Tuesday, 25th June.
Maritzburg.—Thursday, Friday, and Saturday, 27th, 28th, and 29th June.
Durban.—Wednesday, Thursday, and Friday, 3rd, 4th, and 5th July.
Lower Umzimkulu (Port Shepstone).—Tuesday, 9th July.
Stanger.—Wednesday, 10th July.
Camperdown.—Thursday, 25th July.
New Hanover.—Wednesday, 24th July.
Richmond.—Unfixed.
Ixopo.—Thursday, 20th June.
Noodsberg Road.—Unfixed.

Farm Employment.

Young man seeks employment on farm, with a view to learning farming. Speaks English and Dutch.—V. HAUTEKIET, Nieuport, Bains, Belgium. [2]

Young man seeks employment on farm in order to learn farming.—ELLESMERE ELLIS, P.O. Box 1025, Johannesburg. [4]

South African Produce Markets.

CAPETOWN.

The Produce Department of the firm of R. Müller, Capetown, reports, under date of the 28th May, 1912, as follows :—

Ostrich Feathers.—Both out of hand and by public auction sales have been held, and, as to price, no material changes have to be reported. Speaking all round, one may say that the market has remained firm. A very satisfactory demand exists for all better class feathers. Farmers would act in their own interest by sorting the feathers properly, or otherwise they should give instructions that the sorting is to be done here.

To-day's quotations are as follows :—

	£	s.	d.		£	s.	d.
Primes	18	10	0	to	30	0	0
First	12	10	0	„	17	10	0
Second whites	7	0	0	„	10	10	0
Third whites	3	10	0	„	6	10	0
Inferior and stalky whites	1	5	0	„	3	0	0
Byocks and fancy	2	0	0	„	9	0	0
Superior feminas	10	0	0	„	15	0	0
First feminas	7	10	0	„	9	10	0
Second feminas	3	0	0	„	6	0	0
Third feminas	1	5	0	„	2	10	0
Greys	1	10	0	„	7	0	0
White boos	0	15	0	„	2	10	0
Light boos	0	12	6	„	1	15	0
Dark boos	0	3	0	„	0	15	0
Inferior boos and tipless	0	1	0	„	0	12	6

	£	s.	d.		£	s.	d.
Long blacks	2	10	0	to	6	15	0
Medium blacks	2	0	0	„	3	10	0
Short blacks	0	5	0	„	1	5	0
Long floss black	1	7	6	„	2	10	0
Medium floss black	0	12	6	„	1	5	0
Short floss black	0	7	6	„	0	10	0
Long drabs	1	10	0	„	3	10	0
Medium drabs	0	10	0	„	1	5	0
Short drabs	0	3	0	„	0	7	6
Long floss drabs	1	7	6	„	2	0	0
Medium floss drabs	0	12	6	„	0	17	6
Short floss drabs	0	5	0	„	0	10	0
Inferior long blacks and drabs	0	12	6	„	1	15	0
Common blacks and drabs	0	1	0	„	0	5	0
Spadonas	0	7	6	„	3	0	0

Wool.—At the London auction sales, which were held at the beginning of this month, the demand was very satisfactory, although prices were somewhat irregular. They hardened towards the end of the sales on account of a strong demand for the German trade. Inferior wools remained unchanged. Medium quality was sold at par to a halfpenny advance. Snowwhite and wools of superior qualities were disposed of at a rise of a halfpenny. Heavy wools showed a decline of a farthing to a halfpenny. In the Capetown market not much wool has been offering during this month, but the local quotations are altogether steady, competition proving satisfactory, which will be learned from the following prices, viz. :—

	d.		d.
Calvinia, long	6¼	to	7
Calvinia, short	5	„	5½
Karoo and Roggeveld	6	„	6¾
Short burry wools, heavy	4	„	4¾
Short burry wools, light	5	to	5½
C. and C., best grease	4¾	„	5½
C. and C., medium	3¼	„	4½
C. and C., inferior	1½	„	3

Skins.—Last week the public sales took place at London. Heavy weights receded a halfpenny per pound ; medium weights averaged a farthing decline, light and extra-light weights were in good demand and sold at previous prices, as did kids, which were in fair demand. Prices also remained unchanged for dried, damaged, and bastard skins. To-day's Capetown quotations are as follows :—

Goatskins, light	13d. per lb.
Goatskins, heavy	10½d. per lb.
Sundried and kids	7d. per lb.
Angoras	7d. per lb.
Angoras, bastard	10d. per lb.
Longwools, Caledon	5½d. per lb.
Longwools, grassveld	5½d. per lb.
Longwools, Karoo	5d. per lb.
Shortwools	3½d. per lb.
Pelts and damaged	3d. per lb.
Bastards	4½d. per lb.
Capes, large	3s. each.
Capes, medium	2s. 3d. each.
Capes, cut	1s. 3d. each.
Small and damaged	7d. each.

PORT ELIZABETH.

Messrs. John Daverin & Co. report under date 25th May :—

***Ostrich Feathers.*—Owing to Friday being a holiday, there was only a two days' sale held this week, when the usual average assortment was offered. Competition on both days was very weak and irregular, and prices for all descriptions of whites and feminas showed a decline of 10 per cent. compared with prices ruling three or four weeks ago; but blacks, drabs, tails, and spadonas sold fairly well, prices on the whole showing little change.**

The large supplies are causing a nervous feeling in the trade, hence the set back.

There will be only a two days' sale held next week, owing to another holiday falling on Friday, the 31st (Union Day).

Next week's shipment will be the last to reach the London July sales, and the next London sales open on the 3rd proximo, when about £300,000 value will be offered. The feeling is that this sale will go off well.

The total quantity sold on the public market this week amounted to £15,942. 1s. 9d., and weighed 6727 lb. 15½ oz.

We quote the following as current prices of—

	£	s.	d.		£	s.	d.
Primes:							
Extra super	20	0	0	to	27	0	0
Good	12	10	0	„	18	0	0
Whites:							
Good to super	9	0	0	„	11	10	0
Good average	7	0	0	„	8	0	0
Average	6	5	0	„	7	5	0
Common and narrow	2	10	0	„	4	10	0
Good broken	6	5	0	„	8	10	0
Thirds	1	5	0	„	3	0	0
Fancies:							
Good	6	0	0	„	6	15	0
Ordinary	4	10	0	„	5	10	0
Feminas:							
Super	9	10	0	„	14	10	0
Good average	6	0	0	„	8	0	0
Average	4	5	0	„	5	5	0
Common and narrow	1	2	6	„	3	0	0
Good broken	4	5	0	„	7	10	0
Thirds	1	0	0	„	2	0	0
Greys:							
Good	4	10	0	„	6	5	0
Ordinary	2	10	0	„	4	0	0
Tails:							
Male, good, big, bold	2	0	0	„	3	5	0
Male, good average	1	5	0	„	2	0	0
Short and narrow	0	10	0	„	0	17	6
Female, light, good big, bold	1	10	0	„	2	5	0
Female, light, good average	0	15	0	„	1	0	0
Female, light, short and narrow	0	3	6	„	0	10	0
Tails (contd.):							
Female, dark, good, big, bold	0	15	0	to	1	2	6
Female, dark, good average	0	5	0	„	0	15	0
Female, dark, short and narrow	0	0	6	„	0	2	6
Blacks:							
Long (special)	5	15	0	„	8	10	0
Long, good	3	10	0	„	4	15	0
Long, fair	2	10	0	„	3	5	0
Long, drabby	1	10	0	„	3	0	0
Medium	1	10	0	„	3	5	0
Short	0	5	0	„	1	2	6
Wiry	0	0	6	„	0	2	0
Floss, long	0	15	0	„	1	12	6
Floss, short	0	6	6	„	0	12	6
Drabs:							
Long, special	3	0	0	„	4	5	0
Long, good	1	10	0	„	2	10	0
Long, fair	1	0	0	„	1	7	6
Medium	0	12	6	„	1	7	6
Short	0	2	6	„	0	6	0
Wiry	0	0	3	„	0	1	0
Floss, long	0	15	0	„	1	12	6
Floss, short	0	6	6	„	0	10	0
Spadonas:							
Light (special)	4	0	0	„	5	0	0
Light, fair to good	1	10	0	„	3	0	0
Light, narrow	0	12	6	„	1	0	0
Dark	1	0	0	„	2	10	0
Chicks	0	0	6	„	0	2	6

The following may be quoted as the approximate current values of unsorted parcel per line :—

	Whites.							*Feminas.*						
	£	s.	d.		£	s.	d.	£	s.	d.		£	s.	d.
Superior pluckings	8	10	0	to	10	0	0	7	0	0	to	8	10	0
Good average lots	7	5	0	„	8	0	0	5	10	0	„	6	10	0
Poor average lots	4	15	0	„	5	15	0	3	5	0	„	4	5	0
Common lots, stalky, narrow, and dis-discoloured	3	10	0	„	4	10	0	1	15	0	„	3	0	0

	Tails.					*Blacks.*					*Drabs.*					*Spadonas.*				
	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s.	d.	s.	d.		s.	d.
Good	12	6	to	22	6	25	0	to	65	0	15	0	to	25	0	30	0	to	40	0
Average	8	0	„	12	6	14	0	„	17	6	7	6	„	12	6	20	0	„	30	0
Poor	3	6	„	5	0	10	0	„	12	6	4	0	„	7	6	5	0	„	15	0

It will be understood that for special lots these quotations may be exceeded.

Wool.—There is nothing new to report in this market, and a moderate business has been done in the open market at unchanged prices.

The stock now held is moderate and is chiefly made up of very fatty and faulty lots.

At the catalogue sale on Wednesday, 2212 bales were offered, of which only 500 bales were sold. The tone was weak and irregular, and in many instances several lots were passed without a bid being made.

On the public market on Thursday a large quantity was offered, made up of the usual oddments and coarse and coloured, prices showing no change.

We quote the following as current prices of—

	d.		d.
Snow-white extra superior	18½	to	19½
" superior	17	"	18
" good to superior	16	"	16½
" inferior faulty	13	"	15
Grease, super long, well-conditioned, grassveld grown (special clips)	8½	"	9
Grease, super long, grassveld grown	7	"	8
Grease, super long, Karoo grown (special clips)	7½	"	7½
Grease, super long, Karoo grown	6¾	"	7
Grease, super long, mixed veld	6¼	"	7
Grease, light, faultless, medium, grassveld grown	6	"	6½
Grease, light, faultless, medium, Karoo grown	6	"	6½
Grease, light, faultless, short, Karoo grown	5	"	5¾
Light Karoo lambs	6½	to	7
Crossbred grease	5¼	"	5¾
Crossbred scoured	12½	"	14
Grease, coarse and coloured	4	"	4¾
Scoured, coarse and coloured	5	"	8
Basuto grease, short	5⅜	"	5⅝
O.F.S. grassveld grease, long and well-conditioned (special clips)	6¾	"	7
O.F.S. grassveld grease, long and well-conditioned	6	"	6½
O.F.S. grassveld medium grown, light, with little fault	5½	"	6¼
O.F.S. grassveld short, faulty, and wasty	4	"	5
O.F.S. Karoo grown, long and well-conditioned	6	"	6¼
O.F.S. medium grown, light, with little fault	5	"	5½
O.F.S. short, faulty, and wasty	4	"	4½

Mohair.—This market continues in a very unsatisfactory state, and sales are made with difficulty, the top price for best firsts being 9½d; good average, 9d.; mixed and stained, 8d. to 8½d.; kids, if at all mixed, 12d. to 14d., choice lots fetching up to 18d.

On the public market on Tuesday a large quantity was offered, chiefly made up of mixed Free State parcels; competition was irregular and prices at times were quite a farthing lower.

The following are current values of—

	d.		d.
Super summer kids	18	to	18
Ordinary kids and stained	12	"	14
Superior firsts, special clips	10	"	10
Ordinary firsts	9¼	"	9½
Short firsts and stained	8½	"	9
Superfine long blue O.F.S. hair	9½	"	10
Mixed O.F.S. mohair (average)	8½	"	9
Mixed O.F.S. mohair, very mixed	7½	"	8
Seconds and grey	6	to	7
Thirds	4¼	"	4½
Winter kids, special clips	None off- ring		
Winter kids, good ordinary			
Winter mohair			
Basuto mohair	8½	"	9½
Basuto mohair, grey	4¾	"	5½

Skins.—We sold this week—

Sheepskins, 4¾d. per lb.; damaged, 3¾d. per lb. Pelts, 2¾d. per lb.; damaged, 1½d. per lb. Hair capes, 2s. 4d. each; sun-dried, 1s. 4d. each; cut, 1s. each; damaged, 5d. each. Coarse wools, 4¼d. per lb. Goat, 1s. per lb.; heavy, 9¼d. per lb.; sun-dried, 9¾d. per lb.; damaged, 4½d. per lb. Bastards, 10d. per lb.; damaged, 3¾d. per lb. Angora, 8d. per lb.; sun-dried and heavy, 7d. per lb.; shorn, 5½d. per lb. damaged, 2½d. per lb. Springbok, 9d. each. Johannesburg sheep, 4d.; damaged sheep, 3d.; pelts, 2¼d.; goat, 10¼d.; damaged, 5¼d.; angora, 6¾d.; damaged, 2¼d. per lb.

Hides.—Sun-dried, 10¼d.; damaged, 9¼d.; salted, 9d.; damaged, 8d. per lb.

Horns.—3½d. each all round.

EAST LONDON.

Messrs. Malcomess & Co., Ltd., write under date 29th May:—

Wool.—The London sales took place on the 4th inst. and closed with prices ruling as follows:—

Long super combing grease	Unchanged.
Long heavy combing grease	5 per cent. lower.
Short grease	par to 5 per cent. lower.
Snowwhites	Unchanged.

In view of the large offerings and the very serious crisis the country had gone through a most satisfactory quantity was disposed of.

254,000 *bales* approximately being sold out of 273,000 offered, the quantities held over for the next series, starting on the 2nd July, being roughly 17,000 bales, Australians; 2000 bales, Capes.

The general prospects at the close pointed to much the same value ruling next series, perhaps even a slight hardening, but the position has been seriously complicated by the fresh strike which has broken out in the Port of London, where dock labourers and carters are out on strike. All handling of merchandise of every description has been disorganized; wools being held up in transit and foodstuffs unable to be placed on the market.

With the possibility of a general strike being declared in other ports as well, the fresh start which had just been made by all branches of trade, is likely to experience another set-back and will not tend to encourage speculative buying in the Colony.

In *Bradford* a fair amount of business has nevertheless been done during the month, prices ruling between 24½d. and 25d. for the spot article.

The *Continental* market has been fairly quiet, business done being mostly at unchanged rates.

Locally the differences between buyers and sellers have not yet been settled with regard to certain charges, but it is hoped that a settlement is in sight. The consequence has been that the usual auctions have *not* been held, but we ourselves having come to arrangements with the buyers held auctions of our own stores and putting through extensive sales. One way or another considerable quantities have been taken off the market during the current month, and we make stocks in town at present about 12,000 bales. Some of the buyers are already beginning to leave for Europe and others will soon follow.

Sales are approximately as follows:—

Week ending	4th May	2,500	bales.
"	11th "	2,500	"
"	18th "	2,000	"
"	25th "	2,250	"
"	31st "	1,000	" approximately.
	In all	11,000	bales.

We quote:—

	d.		d.		d.		d.
Transkeis	6	to	7	Good short well-conditioned grassveld	5	to	7
Basuto native grease	5	"	5¾	Short faulty grease	4	"	5½
Ordinary native grease	5	"	5⅞	Coarse and coloured grease	2½	"	4½
Superior short-skirted Kaffrarian farmers	7	"	8½				

Mohair.—There is absolutely nothing to report under this heading. At Home the market is very quiet, and spinners are holding back as they expect prices in the Colony to fall with new season's arrivals, while on this side many farmers are holding their clips back owing to low values ruling.

We quote nominally:—

	d.		d.		d.		d.
Good new season's firsts	8	to	9½	Seconds and greys	5	to	6
Superior new season's kids	14	"	16	Thirds	4½	"	5
Average new season's kids	12	"	13½	Basutos	8½	"	9½
Mixed O.F.S.	8	"	9½				

Sundry Produce.—Hides, 10 to 10¼d. for S.D., 8¾d. for D.S. Goatskins, 11½d. Angoras, 7¾d. to 8⅝d. Sheep, 4⅝d. for woolled skins; 4d. for coarse-woolled skins; 2½d for pelts; 3¼d. for Transkei parcels.

DURBAN.

Reid & Acutt's Wool Mart, Ltd., Esplanade, Durban, report as follows under date 1st June:—

Wool.—The month just closed has exhibited no feature of outstanding interest, and the fact that the season is now practically at a close leaves us without any items of importance to report.

During the month we catalogued 4209 bales of wool and mohair, of which we sold 3024 bales, and stocks remaining on hand in this market are now practically nil.

The London auctions closed on 4th inst., when the general situation was summed up in the following cablegram received from our correspondents there, viz. :—" The sales have ended compared with the closing rates of last series, as follows :—

Grease, combing, light	2½ % lower.	Snowwhite, super	2½ % higher.
Grease, combing, heavy......	7½ % lower.	Snowwhite, average to good .	2½ % higher.
Grease, clothing, light..	Par.	Snowwhite, inferior.........	Par."
Grease, clothing, heavy......	2½ % lower.		

Since then we have received cabled advice from Bradford to the effect that the industry generally is sound and prosperous, that Cape tops are selling well, and that prices have a tendency to harden.

This better tone has been fully reflected on our auctions, where competition has been brisk and animated with a keen demand for all classes, the only lots remaining dull and difficult of sale being heavy, fatty parcels for which sellers' ideas still rule too high.

Mohair.—We are pleased to say that this market shows more signs of life : the demand on our auctions recently has been brisk, and prices all-round have improved. Stocks locally are extremely small, and this has no doubt helped matters considerably.

Coarse and coloured remains in keen demand and prices are well maintained.

The following are current prices for wool, mohair, etc. :—

NATAL AND EAST GRIQUALAND.

Midlands (nominal).

	d.		d.
Long light sorted clips.........	10	to	11½
Unsorted clips, light and clean ..	8½	..	10
Short to medium lambs.........	6	„	7
Medium to long lambs..........	7	..	8

Utrecht and Vryheid.

	d.		d.
12 months' sorted clips, light and clean......................	7¼	to	8¼
12 months' average clips, light and clean..................	6¾	„	7¼
6 to 9 months' average clips, light and clean..................	5¼	„	6¼
Short to medium lambs.........	5¼	„	6¼
Medium to long lambs.........	6¼	„	7¼

Ladysmith, Newcastle, Dundee, etc.

	d.		d.
12 months' sorted clips, light and clean	8	to	8½
12 months' average clips, light and clean..................	7	„	7¾
6 to 9 months' average clips, light and clean..................	5½	„	6½
Short to medium lambs.........	5½	„	6¼
Medium to long lambs..........	6¼	„	7

East Griqualand.

	d.		d.
12 months' sorted clips, light and clean......................	7¾	„	8¼
12 months' average clips, light and clean..................	7	„	7½
6 to 9 months' average clips, light and clean..................	5½	„	6¼
Short to medium lambs.........	5½	„	6¼
Medium to long lambs.........	6¼	„	7

TRANSVAAL.

Volksrust, Wakkerstroom, Ermelo, Amersfoort, etc.

	d.		d.
12 months' sorted clips, light and clean......................	7½	to	8¼
12 months' average clips, light and clean..................	6¾	„	7¼
6 to 9 months' average clips, light and clean..................	5¼	„	6¼
Short to medium lambs.........	5½	„	6¼
Medium to long lambs..........	6½	„	7

Standerton, Bethal, Middelburg, etc.

	d.		d.
12 months' sorted clips, light and clean	7	„	7½
12 months' average clips, light and clean..................	6¼	„	6¾
6 to 9 months' average clips, light and clean..................	5	„	6¼
Short to medium lambs.........	5	„	6
Medium to long lambs	6	„	6½

Heidelberg, Pretoria, Potchefstroom, Klerksdorp, Lichtenburg, etc.

	d.		d.
12 months' sorted clips, light and clean......................	6¾	„	7¼
12 months' average clips, light and clean..................	5¾	„	6½
6 to 9 months' average clips, light and clean..................	5	„	6
Short to medium lambs.........	5	„	5¾
Medium to long lambs..........	5¼	„	6¼

ORANGE FREE STATE.

Harrismith, Vrede, Bethlehem, Heilbron, etc.

	d.		d.
12 months' sorted clips, light and clean......................	7½	to	8¼
12 months' average clips, light and clean..................	6½	„	7¼
6 to 9 months' average clips, light and clean..................	5¼	„	6¼
Short to medium lambs.........	5¼	„	6¼
Medium to long lambs..........	6¼	„	6¾

Lindley, Kroonstad, Vredefort, Parys, etc.

	d.		d.
12 months' sorted clips, light and clean......................	7	„	8
12 months' average clips, light and clean..................	6¼	„	6¾
6 to 9 months' average clips, light and clean..................	5	„	5¾
Short to medium lambs.........	5	„	5¾
Medium to long lambs.........	5¼	„	6¼

Senekal, Ficksburg, Ladybrand, Winburg, etc.	d.		d.	*Coarse and Coloured.*	d.		d.
12 months' sorted clips, light and clean	7	„	7¾	Free from kemps	4	„	5
12 months' average clips, light and clean	6	„	6¾	Ordinary	3	„	4
6 to 9 months' average clips, light and clean	5	„	5½	Inferior, kempy, and Persian	1	„	2
Short to medium lambs	5	„	5½				
Medium to long lambs	5¼	„	6¼				

BASUTOLAND AND NATIVE WOOLS.

	d.		d.		d.		d.
Superior lots, light and clean	5¼	to	6½	Average lots, heavy and wasty	4	to	4¾
Average lots, light and clean	4¾	„	5¼				

MOHAIR.

	d.		d.		d.		d.
Kids, good length, and super quality	10½	to	13	Ordinary lots	8	to	9
Long blue, super quality	10½	„	11½	Short and mixed winter	7	„	8
Long blue, average	9	„	10	Inferior and coloured	4	„	6

BASUTOLAND AND NATIVE MOHAIR.

	d.		d.		d.		d.
Average lots, mixed quality	8½	to	9½	Average lots, inferior	6	to	8

HIDES, SKINS, HORNS, AND BARK.

Hides.—Sundried, 14 to 20 lb. average, 8½d. to 9½d. per lb.; sundried, inferior, 5d. to 7d.; salted, 7d. to 8d.

Sheepskins.—Long-woolled, 4½d. to 5d. per lb.; short-woolled, 3d. to 4d. Pelts, 1d. to 2½d.; coarse and coloured, 2d. to 3½d.; salted, heavy, 3½d. to 4d.

Goatskins.—Mixed parcels, sound, 3d. to 6d. per lb.; inferior, 1d. to 2½d.

Horns.—3d. to 10d. per pair.

Wattle Bark.—Cut and bagged, good colour and quality, 4s. 9d. to 5s. 3d. per cwt.; cut and bagged, inferior colour and quality, 4s. to 4s. 6d.; uncut in bundles, good colour and quality, 3s. 6d. to 4s.; uncut in bundles, inferior colour and quality, 2s. to 3s.

Ostrich Feathers.—We have held several small sales of these during the month, when all lots submitted encountered a brisk demand, and changed hands at full rates. For one nice parcel of extra super primes from the Orange Free State we realized the satisfactory figure of £40. 10s. per lb.

The following are the prices current here to-day:—

	£	s.	d.		£	s.	d.		£	s.	d.		£	s.	d.
Primes, extra super	20	0	0	to	40	0	0	White tails, good	1	0	0	to	2	10	0
Primes, good	12	0	0	„	16	0	0	Femina tails, good	0	10	0	„	1	0	0
Whites, good average	7	0	0	„	10	0	0	Blacks, long, good	2	10	0	„	3	10	0
Whites, seconds and broken	2	0	0	„	6	0	0	Blacks, medium	1	0	0	„	2	10	0
Light feminas, super	10	0	0	„	15	0	0	Blacks, short	0	7	6	„	1	0	0
Light feminas, average	5	0	0	„	8	0	0	Blacks, floss	0	5	0	„	0	15	0
Light feminas, third	1	0	0	„	3	0	0	Drabs, long, good	1	5	0	„	2	10	0
Dark feminas, firsts	4	10	0	„	6	10	0	Drabs, medium	0	10	0	„	1	2	6
Dark feminas, ordinary	2	0	0	„	4	0	0	Drabs, short	0	2	6	„	0	5	0
								Spadonas, good	1	0	0	„	3	0	0

Current Market Rates of Agricultural Produce and Stock.

The following TABLE OF CURRENT MARKET RATES OF AGRICULTURAL PRODUCE AND LIVE STOCK on Saturday, 1st June, 1912, ruling at the several Centres named. is published for general information.

Centre.	A. Wheat per 100 lb.	B. Wheat Flour per 100 lb.	C. Boer Meal per 100 lb.	D. Mealies per 100 lb.	E. Mealie Meal per 100 lb.	F. Barley per 100 lb	G. Oats per 100 lb.	H. Oat-hay per 100 lb.	J. Lucerne Hay per 100 lb.	K. Potatoes per 100 lb.	L. Tobacco (Boer Roll) per lb.	M. Beef per lb.	N. Mutton per lb.	O. Fresh Butter per lb.	P. Eggs per dozen.	Q. Cattle (Slaughter).	R. Sheep (Slaughter).	S. Pigs.
Cape Province:	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.	s. d.	£ s. d.
Aliwal North ...	8 0	21 6	12 0	6 0	7 6	8 0	8 6	4 6	3 9	6 0	1 0	0 6	0 5	2 0	1 6	10 10 0	30 0	2 10 0
Beaufort West ...	9 0	16 0	11 6	6 6	8 0	8 6	9 0	4 6	4 6	9 0	1 0	*0 4½	†0 4	1 3	2 0	12 0 0	10 0	4 0 0
Capetown ...	—	—	—	6 6	—	8 8	6 8	4 6	5 6	—	‡0 7	—	—	1 4	1 9	—	—	—
East London ...	9 0	18 0	29 0	6 6	13 6	6 6	6 6	3 9	6 0	8 6	1 0	0 5	0 6	1 0	2 6	15 0 0	19 0	1 10 0
Grahamstown ...	7 9	—	—	7 0	—	5 0	7 6	4 4	—	12 6	0 9	0 5	0 5	1 4½	1 11½	—	—	1 15 0
Kimberley ...	9 0	13 6	12 0	6 3	7 6	7 0	7 6	4 9	4 0	10 0	0 6	0 6	0 5	1 11	1 9	10 10 0	25 0	3½d. p. lb.
Kingwilliamstown	7 0	14 6	13 9	5 9	6 6	5 3	6 0	3 0	3 0	10 6	0 7	0 6	0 7	1 9	1 7	12 0 0	17 0	3½d. p. lb.
Port Elizabeth ...	8 0	—	—	6 6	—	5 6	7 0	3 9	3 6	10 0	—	0 8	0 7	1 6	2 6	—	—	1 10 0
Queenstown ...	8 6	13 0	10 6	6 6	9 0	6 0	7 0	3 9	3 6	8 0	0 9	0 6	0 5	1 4	2 0	—	—	—
Natal:																		
Durban ...	—	—	—	6 7	—	—	—	—	—	8 0	—	—	0 4½	1 5	2 9	—	—	0 18 6
Pietermaritzburg	8 6	—	—	5 0	—	10 0	5 0	4 6	4 0	6 6	0 3	0 6	0 6	1 7	1 9	—	—	—
Transvaal:																		
Pretoria ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Johannesburg ...	8 8	—	11 0	§5 2	4 6	6 8	7 3	5 3	4 0	11 9	—	—	—	1 3	2 0	—	—	—
Orange Free State:																		
Bloemfontein ...	7 6	14 0	12 6	5 9	6 6	9 0	7 6	5 9	4 0	7 0	0 6	0 6	0 4½	1 6	2 3	—	—	—
Harrismith ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

* Average (3d. to 6d.). † Average (3½d. to 5d.). ‡ Average (4d. to 10d.). § White; yellow, 5s. 4d.

Summary of Recent Proclamations, etc.

Restriction of Movement of Grass, Grass-hay, etc., out of East Coast Fever Areas in Cape Province and Transkeian Territories (Government Notice No. 649, 7th May, 1912).—Under paragraph (1) of section 16 of the Diseases of Stock Act, 1911 (Act No. 14, 1911), the Minister of Agriculture has ordered as follows:—No person shall move or cause or permit to be moved out of any magisterial district in the Cape Province and the Transkeian Native Territories, which has been declared to be an East Coast fever area, any grass, grass-hay, moss, or other vegetable matter (other than cultivated plants and cuttings), except under the written permission of the Government Veterinary Officer or any other officer authorized thereto by the Department.

Government Notice No. 650, 8th May, 1912.—Under section 16 of the Diseases of Stock Act, 1911, the Minister of Agriculture notifies that any person who contravenes, disobeys, or fails to comply therewith will, under section 21 of the Act, be liable to the penalties specified in that section according to the circumstances therein described.

East Coast Fever: Movement of Cattle.—Under paragraph (*a*), section 16, of Act No. 14, 1911, the Minister of Agriculture orders that no cattle shall be moved into, out of, through, or within the Indwe Sub Division of the Wodehouse District, in the Province of the Cape of Good Hope, as defined in Cape Proclamation No. 311 of 13th September, 1905, except under such conditions as are prescribed by permit granted in accordance with the special regulations made under Act No. 14 of 1911 in respect of East Coast fever. Any cattle moved out of this district shall be branded if the Principal Veterinary Officer so requires. This district shall, for the purposes of the regulations promulgated by Government Notice No. 1749 of 1911, be regarded as an East Coast fever area. All persons desirous of moving cattle from, into, or within this district must first provide themselves with a permit to be obtained on application to the resident magistrate of such district. These permits will be issued: (*a*) To bona fide residents for general movements of transport cattle within the districts and to and from any specified railway station outside of the district which is generally used by the applicant, available for a period of three months and subject to renewal on application and to summary cancellation should this be considered necessary. (*b*) For single movements of cattle other than transport cattle, and shall only be issued on sworn affidavit filed by the applicant to the effect that the said cattle are in good health and have been on the farm or at the place from which it is proposed to move them for a period of three months, immediately prior to the date upon which the application was made.

Introduction of Sheep, Goats, Wool, Mohair, Hides, and Skins from German South-West Africa into Cape Province (Proclamation No. 75, 1912).—Proclamation No. 151, 1910, prohibiting the introduction of sheep, goats, wool, mohair, hides, and skins from German South-West Africa or the Territory of Walfish Bay into the Province of the Cape of Good Hope, is cancelled, the disease known as sheep-pox no longer existing among sheep and goats in that country

Departmental Notices.

AYLESBURY DUCKS FOR SALE.

Persons desiring to obtain Aylesbury Ducks should apply to the Manager, Government Experimental Farm, Grootvlei, P.O. Bloemfontein. Price, 10s. each.

SCHOOL OF AGRICULTURE AND EXPERIMENTAL FARM, POTCHEFSTROOM.

A short course of Instruction upon Agriculture and Live Stock, Veterinary Science, Agricultural Engineering, Dairying, Poultry, Horticulture, Agricultural Botany, Agricultural Chemistry, and Agricultural Zoology and Entomology will be given, beginning on August 10th and ending on October 8th. Full particulars may be obtained on application to

ALEX. HOLM,
Principal.

School of Agriculture,
Potchefstroom, 30th May, 1912.

Outbreaks of Anthrax.

THE following questions were asked in Parliament on the 1st inst.:—

(1) Whether the Minister is aware that anthrax has been in existence in Boksburg District since November last, and that the centre of its location is a place occupied mainly by dairy farmers who, it is alleged, sell milk in the district, and that since the outbreak of the disease twenty-four head of cattle have died therefrom, while others are still suffering from the disease, and that one native has also succumbed to the disease.

(2) Whether it is correct that at the outbreak of the disease whilst the police were proceeding to enforce quarantine regulations, the Government removed the provisional quarantine regulations, and allowed owners of dairy cattle to sell their milk to the public, to the latter's great danger and risk.

(3) If these allegations or any of them are well-founded, what steps does Government intend to take to forthwith stop sale of milk to the public from cows suffering from anthrax.

(4) Whether Government will cause any delinquent officials, as well as the offending owners of the cattle, to be prosecuted and punished;

and were briefly replied to in the following terms by the Minister of Agriculture:—

(1) Sporadic cases of anthrax occur from time to time along the Reef and in other parts of the Transvaal, but as these outbreaks generally terminate with the proper disposal of carcasses of the affected animals, it is not customary to impose a period of quarantine when the source of infection is not located, and provided the carcasses are disposed of in the proper manner, because no rule can be laid down as to the persistence of veld infection. In all, since the beginning of the year, nineteen cattle and one horse have died of this disease on nine different farms on the East Rand. These deaths have occurred as follows:—Springs, 1; Vlakfontein, 7; Modderfontein, 1; Klipfontein, 2; Brakpan, 4; Driefontein, 1; Natal Spruit, 3; Benoni, 1. These deaths have occurred over a wide area, and cannot, generally speaking, be attributed to any common source of infection. The native who died, to whom reference is made, died at the Vlakfontein outbreak, which was not officially reported to this Department, in consequence of infection contracted by unauthorized cutting up of the carcass of an anthrax animal, to whose dissection the subsequent high mortality on that farm may be attributed. No animals are now known to be suffering from the disease.

(2) The incident referred to is based on the circumstance that provisional quarantine imposed by the police in one instance pending arrival of the veterinary surgeon was subsequently withdrawn by him when he ascertained that the carcasses of affected animals had been properly disposed of.

(3) Danger to the public, so far as the use of milk is concerned, is practically non-existent on account of the rapid course of the disease, as infected animals are generally found dead without having been previously noticed to be sick.

These outbreaks, which have given rise to a good deal of public uneasiness, which has not been diminished by the appearance in various local newspapers of alarmist and exaggerated reports regarding the number of animals affected, have in all probability originated through animals chewing infected bones or grazing in vleis dried up by reason of the recent drought in which carcasses of unburied animals have lain, and when a succession of deaths has occurred in any area within a limited period, it has invariably been found on inquiry that an unreported death had occurred there previously, and the carcass had either been opened and the blood and other infective material had been left on the veld where it was picked up by other animals while grazing, or that it had been cut up and carried away by natives, sometimes with disastrous results to themselves; and in municipal areas like those along the Reef, the difficulty in dealing in an adequate manner with outbreaks has been aggravated to a great degree by the fact that owners who lose animals frequently take no steps to arrange for the removal of the carcasses in order to evade payment of the municipal fees charged for the removal of the bodies, the result being that carcasses may and sometimes do remain for days on the veld unnoticed and unclaimed, to the great risk of all stock owners in the vicinity.

To call the attention of those interested to the matter, the warning reproduced hereunder was handed to the Press for publication, and duly appeared, but in spite of this warning cases still occur along the Reef in which unclaimed carcasses are found by the police, nor is such carelessness confined to the Witwatersrand, as a case came to the notice of the Department a few days ago in one of the outside districts in which a stock owner who had lost an animal from which blood smears were taken by the police for examination, subsequently skinned the animal, allowed a native to remove some of the meat, and place the hide in a pool of water in which his cattle usually drank. Subsequently, the cause of death was reported to be suspicious of anthrax, but prompt action was taken to prevent the further spread of infection, and, so far, success has attended the efforts of the Department.

ANTHRAX.—WARNING.

The attention of the public is directed to the fact that the safety of stock and of human beings has lately been endangered in several instances by the omission of stock owners to report promptly the occurrence of sudden deaths amongst the animals in their charge to the officials appointed to receive such reports and by the indiscreet handling and disposal of carcasses of animals so dying which have been dealt with in such a manner that the dissemination of infection has in some cases led to further losses when anthrax has been the original cause of the mortality. For this reason stock owners are urged in all cases in which animals die suddenly, and for no apparent reason, to lose no time in reporting the occurrence, and in any case in which the officers of the department are unable from pressure of

work or other reason to make timely inquiry the carcasses of such animals should be dealt with as anthrax suspects and should be burnt or buried intact and without being cut or incised in any way at a depth of not less than 6 feet, preferably in quicklime, in a spot where there is no danger of their contaminating a water supply, and the grave should be subsequently fenced in or other animals should be prevented from grazing over it. In any case in which the carcass has been inadvertently opened, however, with or without the knowledge of the owner, the greatest care should be taken to see that all blood and contaminated litter are first soaked with a disinfectant such as 10 per cent. solution of Jeyes' fluid or other disinfectant, and subsequently collected together and buried along with the carcass, and the place where the animal has lain should be disinfected in a similar manner.

The following extract from the Stock Diseases Regulations and a description of the disease is appended hereto for public information:—

GOVERNMENT NOTICE No. 1749 of 1911.

12. Every written report made under Minister's order as to the discovery or suspicion of disease shall be sent by registered post to the officer in charge of police at the place where the magistrate's court is held or shall be delivered to that officer by hand, and the said officer shall transmit a copy of the report to the Government veterinary officer and the Principal Veterinary Officer:

Provided that if any person making the report hand it to a field cornet, Government veterinary officer, stock inspector, or a commissioned or non-commissioned officer of police and has obtained from him a receipt therefor (which it shall be the duty of the field cornet, veterinary officer, stock inspector, or police officer to give), such person shall on production of the said receipt be deemed to have duly reported to the officer of police to whom under this regulation the report is required to be made:

Provided further that if the person reporting be unable to write, he may report verbally, and the officer receiving the report shall there and then take the same down in writing, read it over to the person reporting, and require him in his presence to place his mark thereto, and thereupon the report so reduced to writing shall be deemed to be the written report required by the Minister's order.

Every person receiving a report under the provisos to this regulation shall forthwith transmit the same to the officer in charge of police aforesaid, and shall transmit a copy to the Government veterinary officer and the Principal Veterinary Officer.

Nothing in this regulation contained shall apply to reports as to the discovery or suspicion of scab in sheep or goats, but reports in respect thereof shall be as provided by the special regulations relating to scab.

Anthrax.

A contagious disease caused by a microbe—bacillus anthracis.

Human beings and all animals are liable to anthrax. The disease is seen chiefly in cattle, pigs, and sheep, but not uncommonly in horses.

The disease shows itself suddenly. It is very fatal, and usually lasts forty-eight hours. It does not often in South Africa spread with rapidity from animal to animal, but may affect a number of swine at the same time if they have been fed on anthrax flesh or organs.

A beast which a short time before appeared to be well is found dead or in a dying condition. Frequently blood oozes from the nostrils and the anus. In cattle there are no typical symptoms, but in horses and pigs the throat is often found to be swollen.

The carcass is swollen. Blood is found around the nostrils and anus. The muscles are often infiltrated with blood at certain points. The lungs and glands are congested. The spleen is very much enlarged; it is softer and darker than normal and its substance usually resembles tar.

In equines anthrax infection not infrequently manifests itself by the appearance of extensive subcutaneous swellings frequently involving the brisket or the lower surface of the abdomen. In this form the progress of the disease is less rapid and animals occasionally recover.

In South Africa the enlargement of the spleen as a diagnostic sign has not the same value as in many other countries, for the red-water type of diseases also gives rise to enlargement of the spleen. In the latter type of disease, however, the spleen is not so soft, nor is it so tar-like as in the case of anthrax. The flesh is very dangerous to animals and human beings. It is forbidden to knowingly dissect the carcass of an animal dead of anthrax.